THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXVII. No. 2150.] LONDON, JULY 26, 1904. [56TH YEAR. PRICE 6d.

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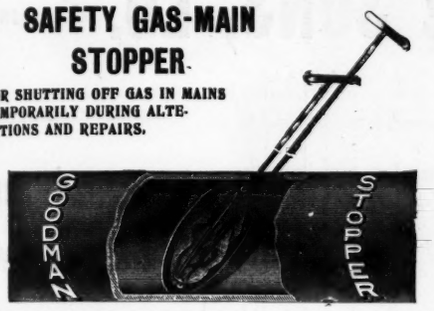

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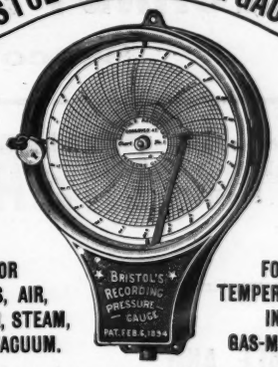

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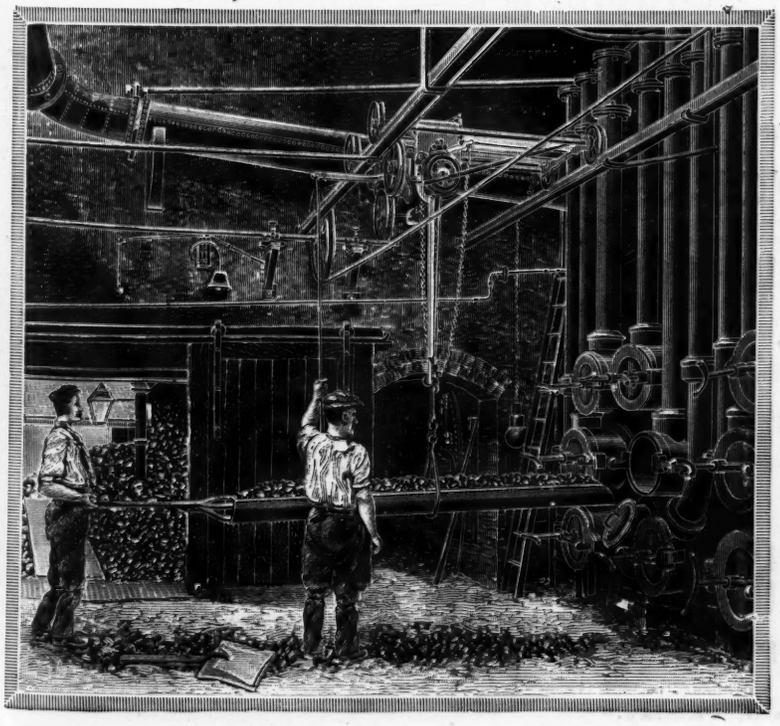

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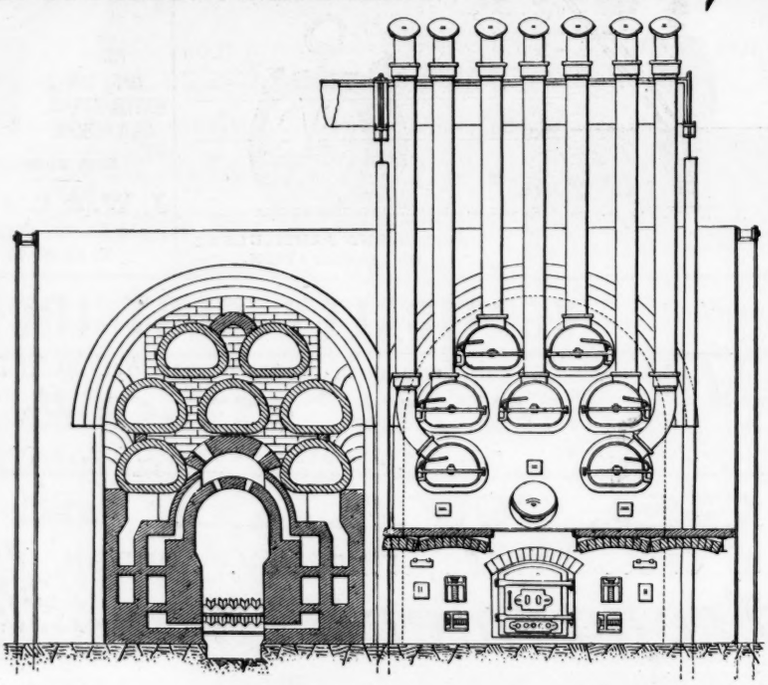

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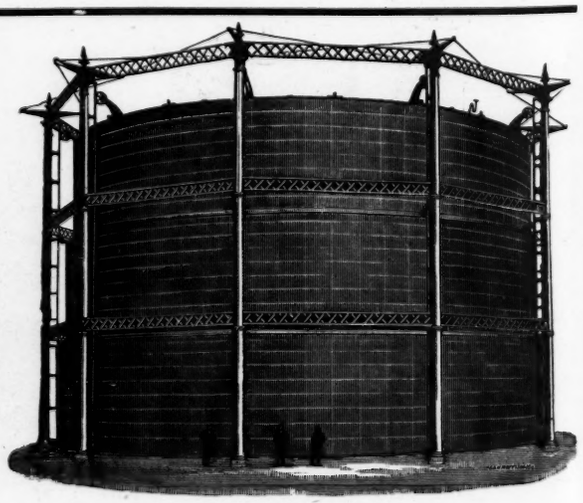

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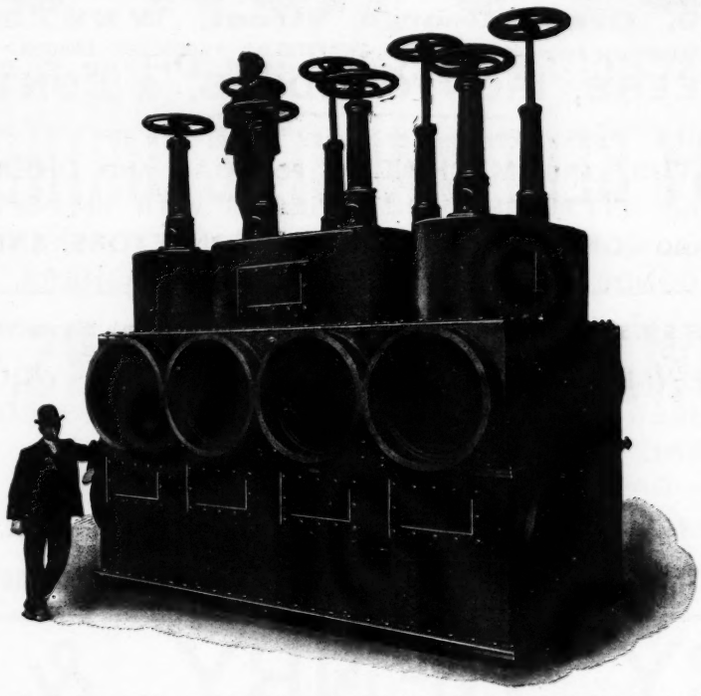

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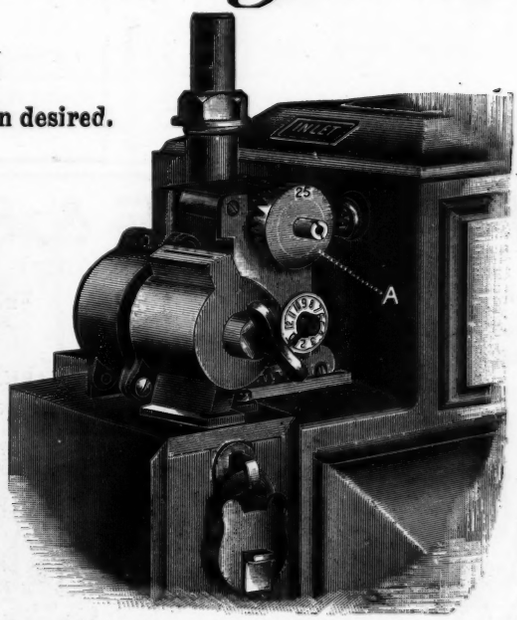

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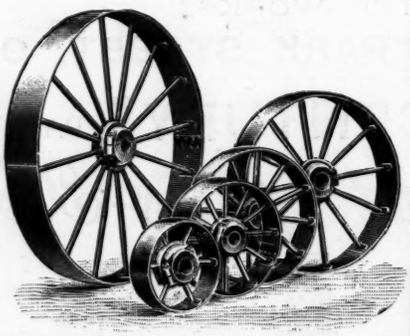

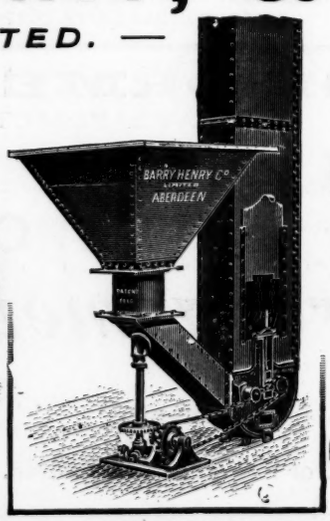

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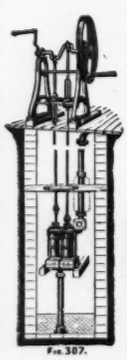

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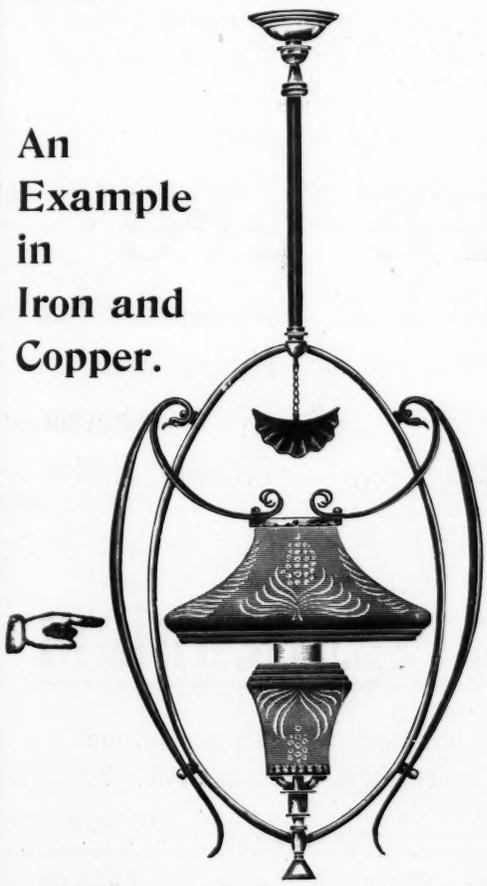

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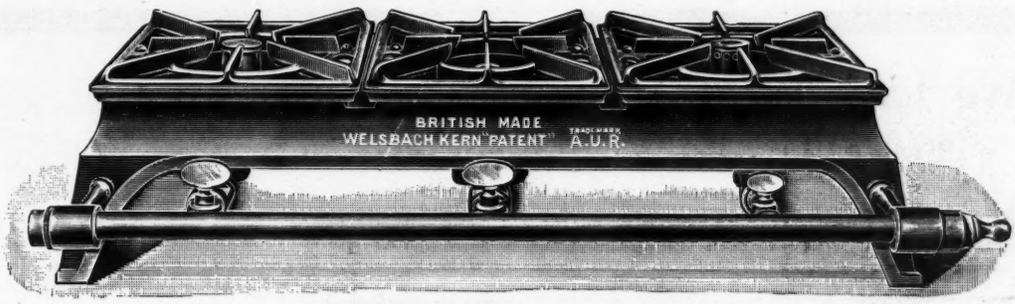
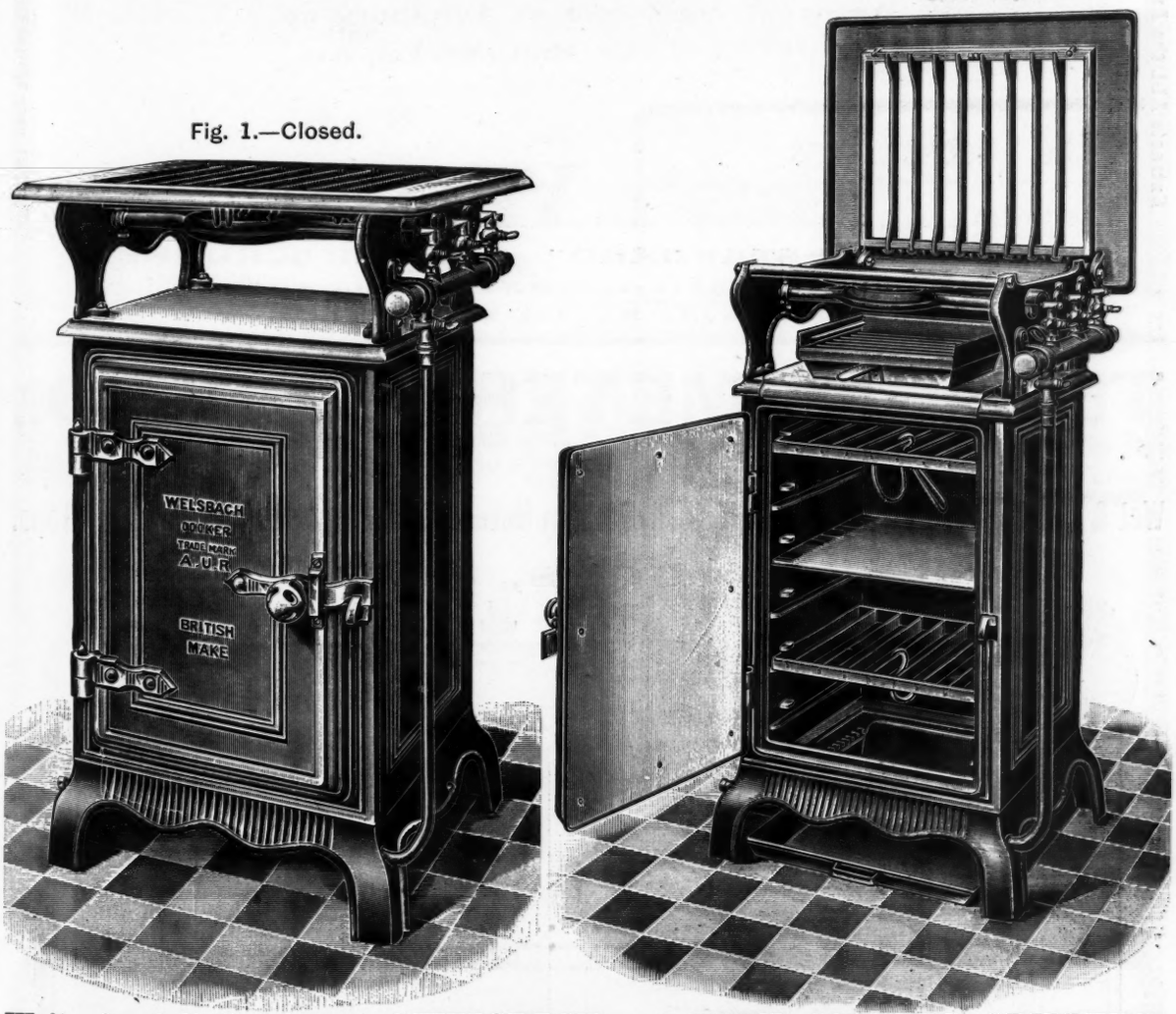


Fig. 2.—Open.

Fig. 1.—Closed.



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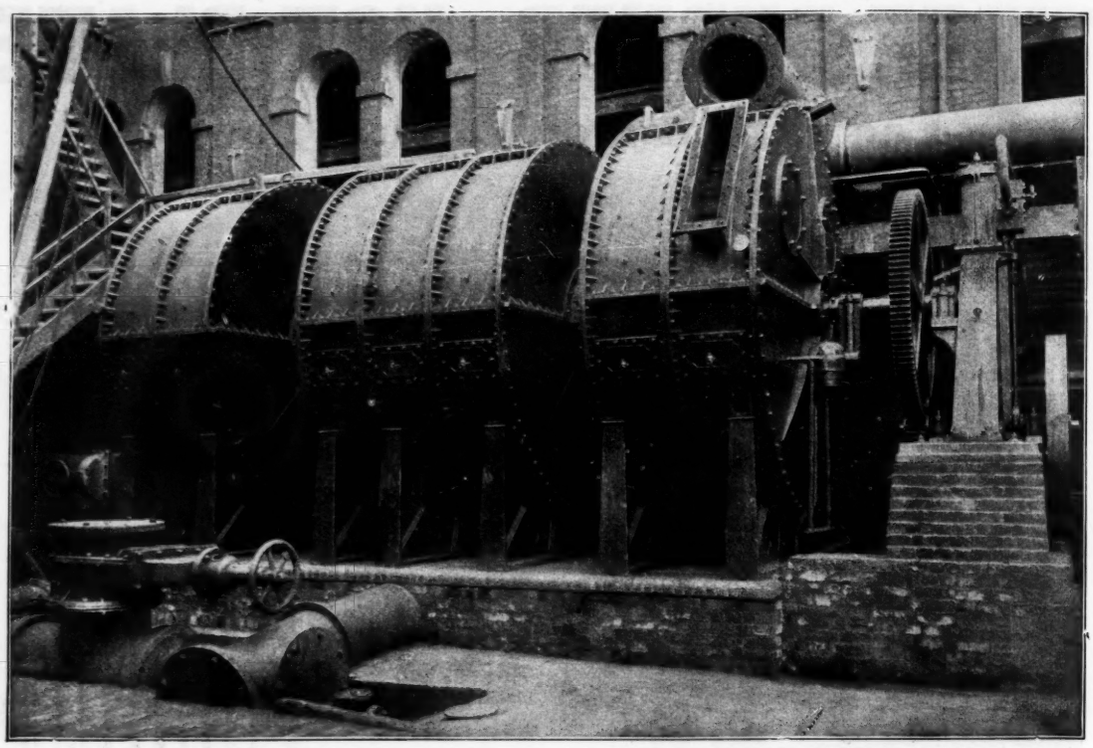

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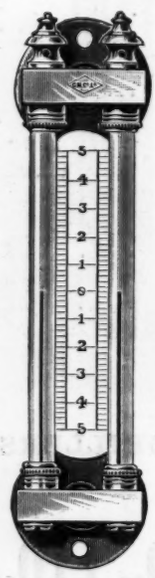

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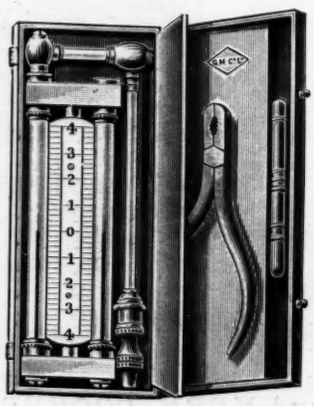

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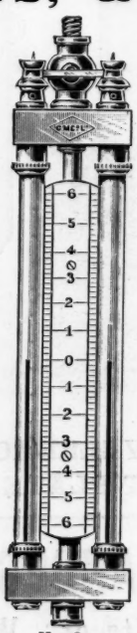

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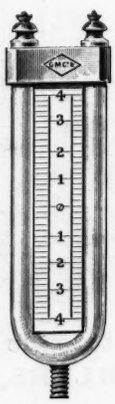

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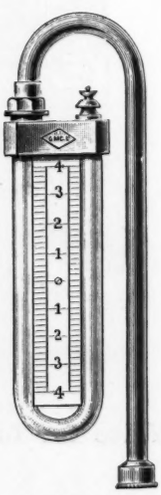

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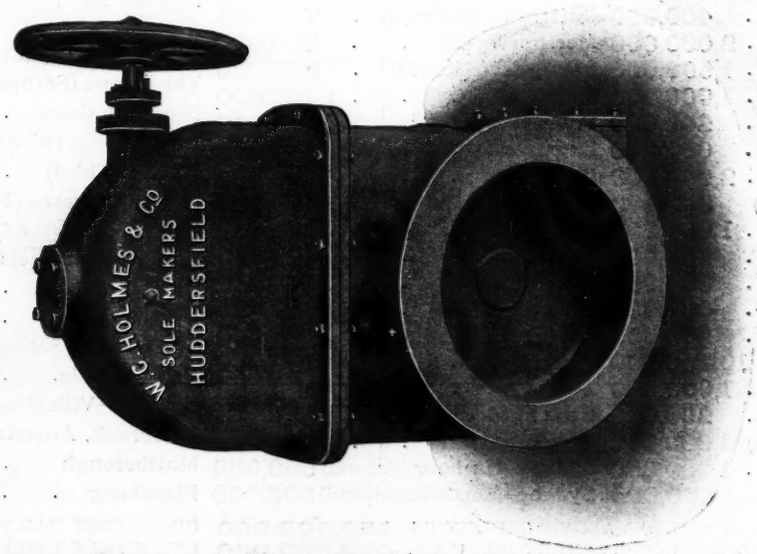

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Sydney (Mortlake)	500,000	Carlisle	600,000	Taunton, (Second)	350,000
Manchester (Second)	3,500,000	Redhill (Second)	300,000	Bognor	100,000
Longton	600,000	Heidelberg	200,000	Bournemouth (Second)	500,000
Hull	1,500,000	Rotterdam (Second)	1,500,000	Vienna	3,500,000
St. Gallen	225,000	North Middlesex (Second)	200,000	Maastricht	200,000
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Dublin (Second)	2,000,000	Merthyr Tydfil	300,000	Tottenham (Fifth)	1,000,000
Birmingham.	1,500,000	Shanghai (Second)	225,000	The Hague (Second)	500,000
Tunbridge Wells	1,000,000	Magdeburg	1,400,000	Hampton Court	500,000
Faversham	200,000	Posen (Second)	700,000	Lea Bridge (Third)	400,000
Staines	600,000	Barrow	300,000	Dublin (Third)	650,000
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Southampton (Second)	500,000	West Ham	1,500,000	St. Gallen (Second)	225,000
Liége	1,000,000	Deventer (Second)	200,000	St. Josse, Brussels	1,000,000
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Chorley	300,000	Malta	400,000	Bridgwater	200,000
Stafford	500,000	Croydon (Third)	625,000	West Ham (Second)	800,000
Bridlington (Second)	200,000	Tilburg	400,000	Brieg, Silesia.	100,000
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Gosport.	200,000	Utrecht (Second)	1,000,000	Marlborough	100,000
Brussels—Ville (Third)	1,500,000	Port Elizabeth	400,000	Flensburg	300,000
Swansea (Second)	1,000,000	Sydney–Harbour (Second)	500,000		
Waltham	400,000	Sydney–Mortlake (Second)	500,000		

H. & G. TOTAL OF ABOVE CAPACITIES **150,500,000** CUBIC FEET DAILY.
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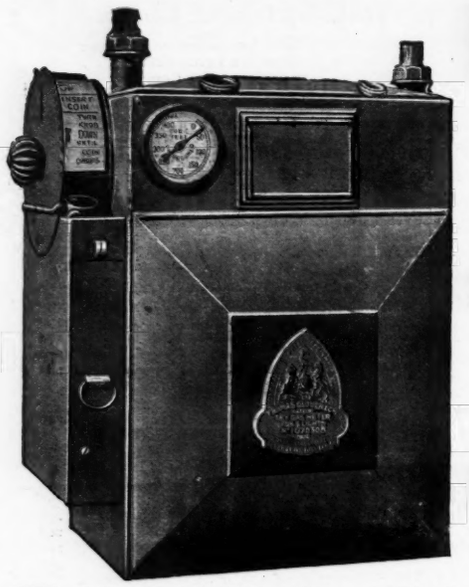

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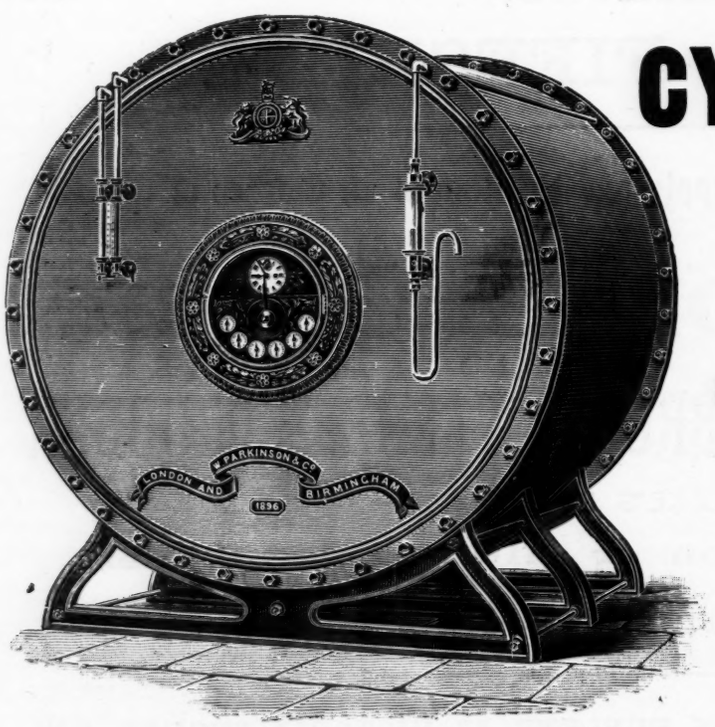

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VOL. LXXXVII., No. 2150.—TUESDAY, JULY 26, 1904.

EDITORIAL NOTES—GAS, &c.

The Economy of Carburetted Water Gas.

In the letter addressed by the Crystal Palace District Gas Company to the consumers, and which was published in our issue of the 12th inst., attention was directed to certain objections to the use of carburetted water gas, from the consumers' point of view. "It," says the letter, "is, if "breathed, more injurious than simple coal gas. . . . It "is very inferior for heating purposes, and when mixed with "coal gas seriously diminishes the efficiency of all gas-fires "and cooking stoves, and causes them to 'light-back,' while "simple coal gas is better for gas-engines and incandescent "burners. Seeing that upwards of 70 per cent. of the gas "supplied to the consumers is thus used, and less than 30 "per cent. in flat-flame burners (which is the most extrava- "gant way of using gas), it is certainly not to the advan- "tage of the consumers to continue enrichment by water "gas." These plain statements are (it goes without say- ing) scarcely to the liking of the advocates of carburetted water gas. This is evidenced by the letter received from Mr. J. W. Helps which was published last week, and which letter is, by the way, a little hypercritical on the subject of Croydon and its removal of sulphur compounds, and not too appreciative of the efforts of Sir George Livesey which have enabled the writer of it to use the qualifying words "until the report of the Board of Trade Committee "was published." We do not doubt that Mr. Helps rejoices in his heart at the new-found freedom which these words are evidently meant to indicate; but if so, why gird at the giver of it as though he had done the gas industry generally, and the Croydon Gas Company in particular, a grievous injustice, instead of a substantial service?

To return, however, to the statements. Who will doubt —coming from the quarter they do—that these have been made in all good faith, and in the best interests of the consumers? It is a question whether they exhaust all that can be said against the use of carburetted water gas, considered from the manufacturers' as well as from the consumers' point of view. What about its cost of production? This is a strong point with its advocates, who, in fact, rely mainly upon its comparative cheapness and convenience, as practically outweighing all other considerations. As to its convenience, there can scarcely be any difference of opinion. All are agreed as to the rapidity and ease with which it is produced, and the facility with which the plant for its production can be brought into operation—rendering it particularly useful in cases of emergency. At the same time, it has to be observed that those who do not use it appear to get on very well without it. It is not, however, easy to reconcile the comparative cheapness which is claimed for it, with the present position of many of the undertakings using it. If it be cheaper to manufacture than coal gas, why is not this advantage more apparent in the prices at present charged to consumers?

Take, for example, the Tottenham and Edmonton Company, who deserve first mention because of the exceptionally large proportion of this gas which they distribute. As long ago as 1895 or 1896, the price of this Company's gas was 3s. per 1000 cubic feet, and from this figure it was only reduced at the commencement of the present year, notwithstanding the advantage which the Company have enjoyed of a large and almost unprecedented increase of consumption. Again, the Brentford Company have only this year contrived to break their record, as to price, of the last nine years. The Commercial Company's gas still remains—unjustifiably, it would seem—at the old familiar 2s. 6d., despite the reduction of the illuminating power from 16 to 14 candles; while the price charged by the Gaslight and Coke Company is actually higher by 2d. than it was nine or ten years ago. As representing the Provinces, Birmingham claims attention as a conspicuous user of carburetted water gas. There, the average price is less by 1d. per 1000 cubic feet than it was eight or nine years ago; but in the same period the Sheffield Gas Company, not using any water gas, have managed to reduce their price by no less than 3d. "Comparisons," said Mrs. Malaprop, "are odorous." But our object in making this comparison is not to set the Birmingham and Sheffield people by the ears; it is in the interest of all concerned. What explanation can be offered of these facts, having regard to the presumed economical advantages of carburetted water gas manufacture?

On any question of this nature "Field's Analyses" constitute a kind of Court of Final Appeal. In them are to be found the records of actual working results, from which there is no getting away. These extend over a considerable number of years; so that it ought to be possible to determine from them whether the position of any particular undertaking has been strengthened or otherwise since its introduction of carburetted water gas. We invite a careful study of the figures with a view to determining this question. Figures, it has been said, can be made to prove anything; but can these figures be made to prove that a gas undertaking which has manufactured both coal and carburetted water gas for the past seven or eight years has thereby improved its position? We fear not; at all events, enough has been said to show that there is, *primâ facie*, a case for further and close investigation.

Reductions of Price in London.

It is with pleasure and congratulation that we announce to-day a further reduction in the price of gas by the South Metropolitan Gas Company. It is a pleasure for several reasons, foremost among which is the fact that it was quite unexpected, not only by those outside the Old Kent Road administration, but by those inside it. The satisfaction of Sir George Livesey and his colleagues on finding themselves in this happy position can well be imagined, in view of the concession of 2d. which they made to the consumers as recently as last Christmas. This twopence represents many thousands of pounds of revenue; and the Directors had a little foreboding at the time the reduction was made that, in view of the comparatively small percentage increases in consumption (the considerable accessions of consumers notwithstanding) that the Company had been experiencing, the profit in the half year just ended would not be sufficient to cover requirements, and that the undivided balance would have to be drawn upon. But apprehension on this score has been succeeded by surprise. The Directors on the completed returns for the half year find themselves in possession of a considerable surplus. Last year they paid a dividend of £5 6s. 8d. per cent.; but for the past half year they will recommend the full dividend at the rate of 5½ per cent. The addition to the dividend will represent £5000; and even then the balance warrants them in reducing the price from Midsummer by a further penny, making the charge a level 2s. per 1000 cubic feet. This price of 2s. is a record for London. It has never before been reached in the Metropolitan area, and, except Plymouth (we believe we may add), in the South of England. What more than this—taken in conjunction with the figures published last week—can those who are hostile to the policy of the South Metropolitan Company require before they will admit that the policy has been fully vindicated?

In making the present reduction, the South Metropolitan Company are but pursuing the ideal which, ever since Thomas Livesey entered its service in 1839, has been steadily kept in view. That ideal is to serve the consumers in the best possible manner, and at the lowest possible price. To this end, dividends were sacrificed in the early days of what may be termed the Livesey management; and the position of the Company was greatly strengthened thereby. Other Companies have followed much the same policy, but none with greater success than the South Metropolitan Company. To it, at any rate, the further modification of the sliding-scale, as suggested by the Board of Trade Departmental

Committee, for the purpose of offering greater inducement to economy, would seem like putting spurs to a willing horse. This Company need no such inducement to do the best they can for their consumers; and we are not sure that, so far as they are concerned, the result would not have been equally satisfactory without any sliding-scale at all. It is, however, but fair and just to the shareholders that good management should have its reward.

The reduction gives the opportunity of referring to what appears to be the goal of Sir George's ambition in the matter of price. When before the Board of Trade Committee last March, having mentioned that the Company were selling gas at 2s. 1d., he gave utterance to this lament: "I have been "struggling all my life—the last fifteen years particularly— "to get the price down; and here we are where we were "ten years ago." By this, it was not, of course, intended to convey to the Committee that there had been no reductions in price in South London in the last decade, but rather that, though there had been reductions, rises had perforce preceded them. As a matter of fact, the price of 2s. 1d. is not far below—only 2d. or 3d.—what it was ten years ago, although the Company were then supplying 16-candle standard gas, as compared with 14-candle standard gas now. That this is so has not been due to any internal debility, but entirely to external causes. However, it has long been apparent that Sir George and his fellow-members on the Board were far from satisfied with the 2s. 1d. price. In their report of six months since, there was a sentence which marked this acutely. "The supply of gas," they said, "for something "below 2s. per 1000 cubic feet is a great *desideratum* for our "towns and cities." "Below 2s." does not exactly define what was in their minds; but we get, just before the quoted lament of Sir George to the Board of Trade Committee, in closer touch with the Directors' (or perhaps it would be more correct to say Sir George's) conception of the possibilities of the future. Speaking of a fuel gas that would answer all the purposes of our town and city life, he said that "1s. 6d. is "a figure that we may reach. I hope we may get to some- "thing below it." The 1s. 6d. may therefore be taken as his ideal price for a gas suitable for all domestic and industrial purposes. By the action of the Board last Wednesday, the odd penny has been knocked off the price at which gas has stood during the last six months; and this brings it to the round figure of 2s., which marks an epoch in the history of Metropolitan Gas Supply. This 2s. will be watched very narrowly by the friends and—well, others who cannot keep their eyes off the proceedings of the Board of the South Metropolitan Company.

By this reduction to 2s., point is added to the inquiry which is made elsewhere as to what has been the influence of the introduction of carburetted water gas upon the prices charged for gas. Here is a Company—the second largest of its kind in the world—having responsibilities in regard to the maintenance of supply second only to those of the Gaslight and Coke Company, fulfilling these responsibilities to the entire satisfaction of the consumers, and taking the lead in reduction of price, without, as the whole industry knows, the slightest aid from carburetted water gas.

In this connection, the improvement in the position of the Gaslight and Coke Company may be noted with satisfaction. The "carry over" this half year exceeds that of last half year by more than £98,000; and this enabled the Directors on Friday to reduce, from the 1st inst., the price of gas to private consumers north of the Thames by 1d. per 1000 cubic feet. This is satisfactory; and it is to be hoped that the Company will not only soon be in the position to further satisfy the natural aspirations of the consumers in this regard, but in other ways to strengthen their position (say) by a return to the prudent policy of former times when depreciation was written off with no sparing hand. What makes this the more necessary is the excess of the Company's capital charges as compared with those of their rivals on the south side of the Thames, which is due, not so much to capital which has become obsolete, as to unremunerative outlay of capital in recent times.

Opinions will probably differ as to the effect of low-priced gas in stimulating consumption, for it is undoubtedly true that where the electric light is preferred, it is not a question of price, but of taste or convenience, or both. For heating purposes, however, it requires to be borne in mind that even the cheapest gas supplied at the present time is at a disadvantage as to cost when compared with other fuel. It is true that the convenience of its application stands us in good stead; but it will not do to rely too much upon this. Every penny by which the cost of gas can be reduced brings it nearer to the point at which the barrier to its general employment as a heating agent will disappear, and it is towards this goal that all must press.

The Valuation of Gas Undertakings.

The award in the Rickmansworth arbitration has been given, and particulars of it appear in another column. It has been awaited with some degree of curiosity as to the result, and presents some features of more than ordinary interest. In the first place, it relates to a statutory undertaking; the Rickmansworth Gas Company working under a Provisional Order by which dividends have been limited to 10 and 7 per cent. on the original and additional capitals respectively. The Company have not, however, been in a position to pay full dividends; the rates since 1897 having been $6\frac{2}{3}$ per cent. on the original, and $4\frac{2}{3}$ per cent. on the additional, capital. The valuations, consequently, were based, not on the actual dividend paid, but upon the full maintainable profit, as they would be in the case of a non-statutory undertaking. Mr. Corbet Woodall, for the Company, claimed $28\frac{1}{4}$ years' purchase of a maintainable profit of £1269 15s. 5d., amounting to £36,188, which, by fittings' profit, 10 per cent. for compulsory purchase, and surplus works, was brought up to £41,147; or, deducting the mortgage debt of £3933, to £37,214. Interest on this mortgage debt was not, however, deducted by Mr. Woodall from the revenue account; so that, according to his valuation, the debt would have been paid twice over by the purchasers. A corrected valuation of £33,440 was, however, handed to the Court by Counsel for the Company before the termination of the proceedings. For the Rickmansworth Urban District Council, Mr. F. H. Jones made out a maintainable revenue of only £809, which was arrived at after deducting £196 for wear and tear and £217 interest on loans. This he capitalized at twenty years' purchase, adding (like Mr. Woodall) 10 per cent. for compulsory purchase, and also £137 for fittings, which made a total of £17,936. The amount of the award is £26,950, including 10 per cent. for compulsory purchase, and *plus* the mortgage debt of £3933. As the annual sale of gas was stated to be $17\frac{1}{2}$ million cubic feet, this works out at £1765 per million. Another feature of considerable interest in the case is that the award is not that of the Umpire alone, as so often happens, but of the Umpire and Arbitrators, who have jointly and severally appended their names to it; and when it is added that these names are those of Sir George Livesey, as Umpire, and Messrs. Joseph Hepworth and H. E. Jones as Arbitrators for the Company and Local Authority respectively, the award will be regarded by everybody as the very best that could be done in the circumstances of the case to render justice to all the parties.

As already observed, this is a statutory concern, and therefore of greater value than an undertaking operating without statutory powers, and to a great extent on sufferance. Such were the Chard and Nantwich undertakings, the awards in which arbitrations were published some time ago, and gave rise to dissatisfaction. How do they compare with the Rickmansworth award? In the Chard arbitration, the award was £35,240, which, with loans taken over, amounted to £40,490 for an undertaking supplying annually less than 20 million cubic feet of gas. This works out at £2040 per million cubic feet sold. In the Nantwich arbitration, the Company were awarded £68,148, which, on the annual sale of 31,456,000 cubic feet, works out at £2166 per million. Thus we have Rickmansworth paying for a statutory undertaking £1765 per million cubic feet; Chard, for a non-statutory undertaking, £2040 per million; and Nantwich, also a non-statutory undertaking, £2166 per million. How can these figures be reconciled, or is it possible to reconcile them? Our readers are quite aware of our objection to municipal trading; but we like to see justice done. Parliament, when giving authority for these purchases, and when occasionally urging local authorities to purchase, could not possibly anticipate the values which are held—and successfully held, as the above figures indicate—to attach to non-statutory undertakings far in excess of any that could accrue to them through parliamentary enactment. Herein the local authorities have a grievance, which calls for remedy.

Higher Chemical Training of Junior Gas Engineers.

THE suggestive address which, in his capacity of President, Mr. W. Cranfield, F.C.S., delivered to the Yorkshire Junior Gas Association early last June has, we are afraid, fallen on rocky ground. It is not expected that the fruit of a new project of the kind—the provision of equipped centres at which junior gas engineers can develop their knowledge and training in respect of the chemistry of gas—can be seen at once; but it generally happens that, when a scheme is popularly regarded, it is soon talked about and discussed. This proposal, put forward in a manner which appeals to and engages the attention, has notwithstanding—measured by the little notice that has been paid to it in correspondence—fallen somewhat flat. We had almost despaired of hearing anything more about it other than from the original source, when to hand comes a letter from Mr. Thomas Berridge. It must be said that it does not make for encouragement when almost everything that is suggested with an eye to assisting in the advance of specialized training, and to give opportunities to all and sundry who exhibit intelligence and are animated by the desire to add to their store of knowledge, is treated slightingly. No one makes it his business to move in the matter, or, so it seems, to bring it officially before the only body who can avail these matters, in order to, if nothing more, have the scheme subjected to inquiry and report, and thus learn the best and worst about it. A modest man like Mr. Cranfield will not do it. He makes an earnest appeal through the only channel he finds immediately open to him. The appeal sees the light of day, is discussed by half-a-dozen people, and then everybody passes over to the other side, and completely ignores the petitioner for consideration. We hope that this further reference to the matter may have the effect of not permitting the proposition so ably evolved and presented to be dismissed, without adequate consideration and sound reasons. If it has the former, it may be found impossible to discover grounds that can be called sound for dismissing it; and, if so, so much the better.

Meanwhile, there is Mr. Berridge's letter. This gentleman has taken time easily in thinking over the address and its objects; and the net result of his consideration is that he is of opinion that the policy outlined in his paper to the Midland Association of three years or so ago, on the training of an engineer, is the better. He believes that the sympathy of the larger Technical Schools should be enlisted, and that they should take up gas manufacture as one of their technological subjects, with suitable equipment. When Mr. Berridge's position is studied alongside that of Mr. Cranfield, the division between them is seen to be so narrow that the former can shake hands with the latter, and extend to him that hearty support so much desired for his larger scheme, which he has no wish to confine to those large centres that can boast of Technical Schools. Mr. Cranfield did not put forward his address as compassing a matured scheme. He submitted it as the rough material from which something good could be fashioned—in other words, as something malleable to which form had yet to be given. Let Mr. Berridge refresh his memory once more by re-reading the last seven paragraphs of Mr. Cranfield's address, without troubling himself with what precedes them; and we shall be surprised if he does not find something there which he will be prepared to countenance, even to the extent of uniting himself in the endeavour to bring it into existence.

Defects of Private Bill Inquiries.

THE other day the opinion was expressed—it does not much matter by whom—that it would be advantageous to have what was described as a "standard" system of dealing with Private Bill Legislation. That the wish is not out of place is evident from the existing jangle in the legislative world, which is due to the varied modes in which parliamentary sanction may now be obtained for local schemes. The outcry that our legislators are being overworked has led to movements towards decentralization which have resulted in schemes that are, no doubt, largely in the nature of experiment. The principal of these schemes is the Private Legislation Procedure (Scotland) Act, 1899, under which special tribunals composed jointly of members of both Houses of Parliament are appointed to hear and dispose of applications, subject to the subsequent approval of Parliament. At the present moment, as readers are aware, there is a proposal to make similar provision in the case of Wales. Then there are powers, particularly in regard to loans, which are virtually legislative, possessed by the Board of Trade, and also by the Secretary for Scotland. This latter form of obtaining parliamentary powers is one which is open to the remark that it is scarcely in accordance with modern notions of governmental methods, inasmuch as it is a reversion from representative institutions to the irresponsibilities of the Minister or his Chief Clerk. We do not require to go far to discover one of the dangers of this method of legislation. But an inquiry was recently held in London before a single Commissioner, appointed by the Home Secretary, into proposed regulations for docks, wharves, and quays. These regulations had been drawn up by the Home Secretary's Department, and they included, among others, a requirement for the provision of life-chains to be hung upon the breast wall of quays, to which men who might fall into the water could cling till they were rescued. The provision is, no doubt, framed in a very properly humane spirit, but it, as well as others, is resisted by the owners of docks in South Wales, Glasgow, and Leith, as being undesirable, and almost impossible. It is evident that whoever recommended this chain is not possessed of much knowledge of the ways of the ocean, for he left out of account the rise and fall of the tide, which would render any single chain useless in the matter of saving life, except for, perhaps, the period of half an hour twice a day. Yet the possibility of such proposals as this being made and given effect to, is one which makes it necessary that great vigilance should be exercised in order to prevent their being "rushed" upon the country.

But there is another phase of the newer methods of legislation which may cause more trouble than the giving of power so extensive to departmental officials, and that is the conflicting decisions of all the authoritative bodies. Only a few days ago, a Select Committee of the House of Commons considered the applications by the Clyde Valley Electrical Power Company for Provisional Orders in relation to the supply of electricity for lighting in the districts of Barrhead, Bothwell, Eastwood, Cathcart, Johnstone, Kilpatrick, Lanark, Renfrew, and Shettleston. The Company already possess authority for the supply of electricity for power in these districts, and under it they are bound to give protection against electrolysis to gas and water pipes. In their present application, they sought to get permission to supply current for lighting without being bound to provide protection. The applications were opposed by the Corporation of Glasgow and by the Airdrie and Coatbridge Water Trust, the former of whom have both gas and water pipes which will be affected, and the latter, of course, only water-pipes. The Select Committee decided that protective clauses must be inserted in the measures. Not long ago, however—to be more particular, on the 21st and 22nd of March—an inquiry was held in Edinburgh, under the Private Legislation Act, into a measure promoted by the Corporation of Leith for the running of electric street cars within the burgh. The application was opposed by the Edinburgh and Leith Gas Commissioners, who sought protective clauses. They were unsuccessful; the Commission deciding that the Gas Commissioners must be content with the protection afforded by the ordinary law on the subject.

At present a great struggle is in progress over suburban tramway companies obtaining running powers over urban lines; and an application with respect to the Newcastle lines is being made the test of the question. How the matter may be settled we do not know; but in Glasgow lately a Parliamentary Commission under the Private Legislation Act had no compunction in deciding, in the face of opposition, that the Corporation of Ayr should have power to extend their tramway and omnibus service into the country. Admittedly, regard must be had, in all such questions, to local circumstances. Probably that is the chief reason for the delegation of powers; and there is no doubt that the system of devolution could be made to work quite satisfactorily, if it were properly organized. The confusion which exists points to the need for the better regulation of the procedure in devolved cases. Experience will most probably suggest points upon which improvement may be made. For one thing, it may be assumed that Parliament ought not to give to any body or person the powers which they give to their own Committees, but that there should be certain principles fixed, beyond which they ought not to go without the sanction of the Houses of Parliament. It may be said that the

provision which requires the sanction of Parliament already effects this; but when the difficulty of overturning a decision arrived at after inquiry is taken into account, it must be conceded that there is not very much force in the remark. Besides, if appeals to Parliament were to become general, the system of devolution would speedily vanish.

The Lamp-Standards on Waterloo Bridge.

It is with considerable gratification that we noticed not long ago, in "The Times" and "The Builder," statements respecting the way in which the London County Council have been brought to book for their maltreatment of Waterloo Bridge in the matter of lighting. Mention has been made in these columns several times of the scandalous fashion in which this Metropolitan Authority has dealt with the Waterloo Bridge lamp-standards, which formed part and parcel of this splendid monument of an age when in this country large responsibilities were not confided to small men. Everybody knows that to the bumptiousness of the London County Council there has been neither limit nor check; but apparently even the busybodies who had the old Waterloo Bridge lamp-standards carted away and replaced by the existing mean electric lamp-posts have now found a master. At a recent meeting of the Council, upon the motion of Sir W. B. Richmond, it was resolved that the Bridges Committee should be instructed to report immediately as to the removal of the original standards, "and "the substitution therefor of lamp-standards wholly out of "character with the bridge, and of particularly feeble design, "and as to the possibility of the reinstatement of the original "lamp-standards." At the next meeting, the Chairman of the Committee (Mr. B. S. Straus) stated, in answer to a question, that they had decided to consult Mr. Frampton as to whether the standards were still fit to be used for electric lighting purposes. He contradicted the statement made that the old standards had been broken up. Sixteen out of the eighteen were perfectly sound, and the others were only slightly damaged and could be easily repaired. The standards, which were not of bronze, but a very good example of old cast-iron, were placed on the bridge in 1817. Certainly, they were more in keeping with the structure of the bridge than the flimsy standards which took their places. Apparently, nobody is responsible for the preservation of any single worthy feature of London. Certainly, nobody ever designed the things that are stuck up in the streets, on the bridges, and all over the Metropolis where the County Council has sway, for anything like the art of design is glaringly absent from the new London which is being built on the old cleared sites; and of all the outrages perpetrated on the streets, the lamp-posts are among the worst. Anyone who may be disposed to suspect this remark of exaggeration, has merely to make the round tour from Westminster Bridge, along Whitehall and the Strand, to Waterloo Bridge, and back by the Victoria Embankment. "The Builder" has published a view of the bridge lamp-posts, from a photograph; but if our contemporary would send a photographer on this round, and publish the result in a page, it would give one of the most striking illustrations ever prepared of maltreatment of a "show" part of London in this important respect.

The Inspection of Factories and Workshops Last Year.

The report of Dr. Arthur Whitelegge, C.B., the Chief Inspector of Factories and Workshops, for the year 1903, has just been issued as a Blue-book. At the close of the year, there were 102,939 factories and 144,148 workshops upon the registers. There were received from occupiers 317,933 statutory reports; among them being 92,600 of accidents, 153,976 of overtime, and 30,531 humidity records. Between April and July the staff was increased by eight inspectors and five assistants, raising the total strength to 116 inspectors and 36 assistants. At the end of the year, there were 1976 certifying surgeons in the United Kingdom, 161 of whom were appointed during the year to fill vacancies. In accordance with the recent practice, definite areas were assigned in each case, following as far as possible well-known local boundaries, such as those of local authorities or wards. The passing of the North-Western Electricity and Power-Gas Bill, authorizing the manufacture and distribution of gas containing large quantities of carbonic oxide, imposed upon the inspectors the duty of enforcing, in all factories and workshops, the conditions laid down in the Act, that the proportion shall not exceed 14 per cent., and that the gas shall be odorized. No less than 92,600 accidents, 1047 of them being fatal, were reported last year—79,294 in factories, 211 in workshops, and 13,095 in other places coming under the Factory Acts. Among other causes of accident, reference is made to the inadequate fencing of the high-power gas-engines which are now coming into use, carbonic oxide poisoning by blast-furnaces, and water gas. With regard to the last named, it is remarked that where this gas is made it is very rare to find that an oxygen cylinder has been provided, or that the steps to be taken in the event of an attack of poisoning are known. It is thought that makers of this plant should, when installing it, give information as to its danger, and as to the nature of the "first aid" to be rendered in case of an accident. The Castner Kellner Alkali Company have drawn up a notice for the prevention of poisoning by Mond gas, and had it put about their works. We give the notice, as well as some remarks upon the ventilation of "gassing-rooms" in silk, cotton, and woollen mills, in another part of the "Journal." There was a further decline in the number of prosecutions last year; the total being 2635, compared with 3426 in 1902, and 3770 in 1901.

Local Indebtedness.

This was the title of a paper read at the recent meeting of the Urban District Council's Association by Mr. H. W. Cook Clerk to the Wallasey Council, who put forward some views which are of especial interest just at the present time, as they are in such marked contrast to those which were last week propounded at the annual meeting of the Industrial Freedom League. Briefly, Mr. Cook's contention is that the ratepayers and inhabitants themselves are primarily the cause of the existing local indebtedness; and that therefore it is not so much a matter for the representative, either on the Council or in Parliament, as to when a halt in municipal progress shall or shall not be called, as for the ratepayer himself, who pays the piper, and so is entitled to call the tune. Taking some of the institutions the establishment of which has been largely responsible for the creation of the debt, he argues that water-works are a necessary of life which should without doubt be under the control and management of the local authority; and that gas-works, "if in the hands of a private company, are certain to be used as a means of profit making and sharing among a limited community who do not necessarily use the commodity, the inhabitants of the district supplied simply helping to fill the pockets of the shareholders." Electricity works and tramways, though more in the nature of luxuries, are, he says, largely in the same category; and the like arguments therefore hold good in favour of their municipal ownership. Dust destructors and burial grounds he also defends; and he points out that public parks and pleasure grounds, recreation grounds, and gymnasia are largely clamoured for by the ratepayer of to-day. How far all these desirable institutions should be extended, seems to him to be again a question for the ratepayers, who may be trusted to take care "that more is not taken out of their pockets than they are willing to pay."

The Power of the Ratepayer

It will thus be seen that Mr. Cook has great faith in the ability and willingness of the ratepayer to look after his own interests. But is this faith fully justified? Is it not a fact that where the ability exists, the willingness is often absent; and that in many cases where willingness exists, the ability is altogether wanting? We seem to have heard of instances in which there is taxation without representation—of large commercial undertakings being called upon to contribute enormous sums over the raising or spending of which they have no control whatever. How in the world are these ratepayers to see that more is not taken out of their pockets than they are willing to pay? This very point was brought out by Lord Avebury, before the Industrial Freedom League, when he said that the country had unfortunately drifted into a position in which, in many places, the principal ratepayers had no voice in, or control over, the expenditure; while another speaker emphasized the fact that those who imposed the burden really paid but a very small proportion, and had little practical experience in the management of the great undertakings they were taxing. So much for the ability of the ratepayers who are willing

to fully protect themselves. Now what about the willingness of those who are able to do so? We venture to think that Mr. Cook must have had an almost unique experience of municipal life if he has met with a general body of ratepayers who on all occasions take an interest anything like commensurate with their importance in local government affairs. What is commonly witnessed is quite the reverse. When an unusually extravagant proposition is made, the average ratepayer may (as the result of a vast expenditure of energy on somebody's part), "for this occasion only," be roused into taking an active interest in the question—merely, however, to sink into apathy again immediately the election is over. We know he ought to exercise his privileges at the ballot, and in other ways; that by not doing so, he is largely to blame for what befalls him. When the rates go up, he grumbles—and pays; it is too late then to do anything else. It is mainly with the object of inducing him to bestir himself before heavy liabilities are incurred, rather than after, that so much attention is being turned to the subject of local indebtedness.

And the Effect on the Rates.

In considering Mr. Cook's views, it must be admitted that he has been fortunate in his own experience. In the year 1897, when he went to Wallasey, the local debt stood at some £500,000; and in six-and-a-half years this figure has been doubled. During the period named, however, the rateable value has increased from £219,212 to £348,075, and the population from 37,000 to 57,000; while the rates, which, owing to the abnormal expenditure, rose from 3s. to 4s. 4d. in the pound, have since decreased to 3s. 8d., "with every prospect, given judicious management, of a further reduction." But are decreasing rates so frequently met with as to constitute a fair argument in favour of the great increase of local indebtedness? Is it not rather the case that in a very large number of towns the burden of taxation—particularly in view of the existing trade depression—is rapidly becoming intolerable to the traders and manufacturers who have to bear so large a proportion? At Bradford, for example, it is stated that the annual amount payable for interest alone reaches a total of nearly 3s. 7d. in the pound. We are sorry not to be able to follow Mr. Cook any further in his able presentation of "the other side" of the question; but before taking leave of his interesting contribution to the literature of the subject, we would just say, with regard to his closing remark—"the Money Market must take care of itself"—that this is precisely what the Money Market endeavours to do. As witness the recent discomfiture of West Ham.

Public Work at Bradford.

In introducing to the notice of the Bradford City Council the estimates for the current financial year, the Chairman of the Finance and General Purposes Committee (Alderman Godwin) was faced with the unpleasant task of proposing an advance of 2d. in the pound on the rates; but as a set-off against this, the gas consumers are to be allowed a like reduction in the price of gas—making the charge 2s. 1d. per 1000 cubic feet. In fact, the customers generally of the Gas Department are gainers by the arrangement, for whereas the concession to them, on last year's consumption, represents £13,560, 2d. in the pound on the district rate brings in only £10,828. There is, however, of course, a still more pleasing feature of the proposal than the mere monetary consideration—that is, the still further acknowledgment it constitutes of the policy of giving the consumers the benefits arising from the supply of any commodity by the Corporation. Though Alderman Godwin, in referring to the temptations which beset the man at the head of a city's financial affairs to keep down the rates by hook or by crook, said that the most alluring means to this end was the appropriation of profits from trading departments, we are pleased to see that he stood firm to his principle that it was wrong to make large profits with the distinct object of relieving the ratepayers. Even he admitted that he had been sorely tempted to finger some of the profits lying ready to his hand; but he was strong enough to resist, where a weaker man would have succumbed. This will make the third consecutive occasion on which nothing has been taken from the trading profits; and Alderman Godwin is justly proud of a policy which renders Bradford so good an example for some other municipalities to follow. He pointed out that, of course, the adoption of this principle accounted in some degree for a higher rate; but nevertheless it is easy to answer his question as to whether the city was better or worse off as the result. The equalization of the burden over the whole of the community cannot be a disadvantage; on the contrary, it has many things to recommend it, foremost among which is the fact that it gives the ratepayers an opportunity of seeing exactly what is the price they are paying for the facilities. Local government carried out on present-day ideas must admittedly be an expensive thing; but it is an advantage all round to know exactly what it does cost, and not to obscure the issue by means of profits which, being made out of the ratepayers themselves, cannot but be taxation disguised. A member of another Corporation a few days ago said that he never looked into their annual accounts "without being reminded of the title of a book written by a French economist some time in the seventies of the last century—'What is seen, and what is not seen.'" Such a remark should not be applicable to the financial statements of any corporation; and the principle adopted at Bradford is at least one means of clearing the issue.

The Exeter Gas Company's Assessment Appeals.

It will be seen by our "Legal Intelligence" that the Recorder of Exeter (Mr. J. Alderson Foote, K.C.) has given his judgment in the appeals by the Exeter Gas Company against the assessment of their property; and it will be found to be in the Company's favour. The position was somewhat peculiar, inasmuch as the appellants have works which extend into the three parishes of Exeter, St. Thomas, and Heavitree; but the bulk of them are in St. Thomas's, the offices are in Exeter, and there are a few mains in Heavitree. Last year the rate in St. Thomas was put up, and this disturbed the balance of payment between the parishes concerned and the rating authorities. The figures laid before the Recorder on behalf of the Assessment Committee showed a total valuation of £7732 for the three parishes, made up as follows: Works and mains in St. Thomas, *plus* sundry small ratings, £3800; mains and offices in Exeter, £3755; mains in Heavitree, £177. The Recorder has decided that the total net rateable value of the whole property is £6171, made up as follows: Exeter, £2397; St. Thomas, £3512; Heavitree, £262. He therefore gave judgment for the figures for Exeter and St. Thomas, and also allowed costs. The Recorder experienced some little difficulty in arriving at his conclusions; but he stated that if there were any errors at all, they were rather against the Company than in their favour.

The Edinburgh and Leith Gas Accounts.

We give in our "Notes from Scotland" to-day a summary of the accounts of the Edinburgh and Leith Gas Commission for the year ending the 15th of May. Apart from the fact that they disclose a satisfactory year's working—there having been an increase in the gas consumption of more than 33 million cubic feet—there is not much that is of unusual interest or importance in the figures. But it may be of interest to compare them with the estimates which were adopted by the Commissioners last September. These showed an estimated revenue of £317,754, whereas the actual revenue has been found to fall short of this sum by £2875. The consumption of gas was below the estimate by 29,901,000 cubic feet; and the revenue from gas is also less by £5262 than was anticipated. Residual products were assumed to yield £52,523, and they exceeded this amount by £3440. Of these, coke is £1993 down; but tar and ammoniacal liquor have yielded £2339 more, and sulphate of ammonia £3402 more than the estimate. On the other side of the account, 9113 more tons of coal were required than were reckoned for; and the cost exceeded the estimate by £12,118. Oil for carburetted water gas cost £2417 less; and salaries and wages were £3673 less. Repairs and maintenance of works and plant came to £920 less. Distribution of gas cost £2376 more, and management £44 more than the estimate. The total expenditure was reckoned at £229,611; and it amounted to £236,409, or £6798 more. The surplus estimated was £6243; and it turned out to be £4389. It will be observed that more than the whole of the surplus which has been earned was due to the increase in the revenue from tar and liquor and sulphate of ammonia. The manufacture of sulphate is a new industry for the Commissioners; and it is satisfactory to note that it has proved a valuable aid to the undertaking.

The large decrease in the cost of oil will also not escape notice. It speaks of the greatly diminished quantity of carburetted water gas which is now made, since the manufacture of gas has been almost entirely confined to the Granton works. Resulting from this is also, in part, the augmented coal bill. The reduction in wages was what was to be expected. The amount may not appear large; but it shows the direction in which the management is moving, because this is a saving upon what was allowed for; and the true comparison is to be made with the year 1902-3, when it is found that the actual reduction is upwards of £12,000. The Commissioners have established a reserve fund, amounting to £5161. It is kept on deposit receipt, and is thus at call when required. Their sinking funds are almost wholly invested in mortgages over heritable property; these funds being appropriately dealt with on a more permanent basis, as there are still four years to run before the Commissioners may require them for the compulsory redemption of annuities. Altogether, the finances of the undertaking, notwithstanding the heavy outlay upon the Granton works, are in a very healthy condition, and quite justify all that the Commissioners have been doing of late years.

WATER AFFAIRS.

A Parting Blow to the New River Company.

As briefly recorded in the last issue of the "JOURNAL," the New River Company have received a heavy blow at the hands of the House of Lords, by reversing the decision of the Court of Appeal in their favour on three points on which the Arbitrators under the Metropolis Water Act, 1902, were against them, and sustaining the judgment of both tribunals in regard to the liability of the Company to contribute to the Chamberlain of London's sinking fund. In the last-named matter, they were associated with other Companies, who had elected to abide by the result. The arguments in the Court of Appeal as well as before the Law Lords have been so fully reported in our columns, and the judgments are given at such length to-day, that it is not necessary to do more here than state the four points at issue. The first bore upon the limitation of the Company's dividend; the second referred to the effect upon the compensation payable to the Company of the retention by them of the Clerkenwell Estate and other surplus lands; the third, to the payment of the land-tax assessed in respect of the undertaking; and the fourth concerned the sinking fund already mentioned.

The whole of the difficulty in connection with the first point arose in consequence of the incorporation of the Water-Works Clauses Act, 1847, in the Company's Special Act of 1852; and the question for the decision of the Courts was: Did section 75 of the General Act, limiting the profits of the Company, apply to the entire undertaking, or only to the works sanctioned by the Act which incorporated it? The Arbitrators held that it was applicable to the whole undertaking; the Court of Appeal took exactly the opposite view; and the Law Lords, with the exception of the Lord Chancellor, restored the Arbitrators' decision. The judgments on this point practically disposed of the second, because, if the above-named section applied to the whole undertaking of the Company, it necessarily included the profits realized on certain lands not directly connected with the supply of water. The Water Board contended that here again the Arbitrators were in the right; whereas the Court of Appeal said they were wrong, and reversed their decision, which the House of Lords, with the exception noted above, restored. With reference to the land-tax, the Arbitrators decided that the payments on account of it were made on behalf of the shareholders, and not of the Company. The Court of Appeal supported the Company's contention that these payments should be treated as expenses of the concern; but this view failed to obtain the support of the Law Lords. On the question of the sinking fund, the Court of Appeal agreed with the Arbitrators; and the higher tribunal supported the judgments previously come to.

As this matter has now been determined by the Court of Final Appeal, it is useless to question the justice of the decisions arrived at. A few observations on the peculiar nature of the case are, however, permissible. Up to 1852, the Company occupied a unique position. Although an undertaking started primarily for the supply of water, it not only possessed landed property, but its original shares (72 in number) were real estate. In the year named, however, additional powers had to be sought; and as five years previously the Water-Works Clauses Act had been passed, its modern provisions had to be engrafted, so to speak, upon the old stock. Up to that time there was no stated capital in the concern; so, in order to get over this anomaly, it was specified in the Bill that the capital already raised and expended should be "deemed to be £1,519,958." Nor was there any limitation of dividend until this was done by the Act of 1847, which, according to the language of section 1, was to "extend only to such water-works as shall be "authorized by any Act of Parliament hereafter to be "passed which shall declare that this Act shall be incor-"porated therewith." Furthermore, the word "undertaking" was defined as "the water-works and the works connected "therewith by the Special Act authorized to be con-"structed;" and by section 75 the profits of the "under-"taking" were not to exceed 10 per cent., or such rate as might be prescribed.

The task of fitting the General and Special Acts into each other ought not to have presented very great difficulty to a skilled draftsman such as the Company would have employed at this critical period in their history; and yet the Act of 1852 is described by one learned lord as a "careless and "slovenly piece of work," and by the Lord Chancellor as a "blunder." What has been the unfortunate result? That £3,000,000—the difference in the amount to be awarded to the Company—has for some weeks been in a sort of seesaw, while highly trained judicial minds have been puzzling over the meaning of a few lines of English which have proved as difficult of interpretation as the verses of a certain modern poet—so difficult, indeed, that four Judges think they mean one thing and four more exactly the reverse! Of course, as the Lord Chancellor remarked, no Court is entitled, in construing a statute, to assume that the Legislature has made a blunder. The language used is that of the promoters of the Bill; and in sanctioning it Parliament does not assume any responsibility for the drafting. That is a matter for legal acumen. This quality was sufficiently in evidence in the present case to cause the insertion in the Act of 1852 of a provision to the effect that the incorporated Act was not to apply where it was "inconsistent with, or "inapplicable to, the undertaking." How it could be made applicable to an undertaking sanctioned by Royal Charter in 1619, the Lord Chancellor and the learned Judges in the Court of Appeal failed to see. Possibly a study of the judgments will make this clear to them, as well as to those of our readers who are sufficiently interested in the matter to peruse them. At all events, they will go down to posterity as good examples of "the glorious uncertainty of the law."

The Air-Lift System of Pumping Water.

IN noticing on July 12 the papers read at the annual meeting of the British Association of Water-Works Engineers, that by Mr. J. W. M. Richardson, the Water Engineer of the Birkenhead Corporation, on the above-named subject, was incidentally referred to. Abstracts of the paper and the discussion on it were given in last week's issue. Whatever may be the merits or demerits of the air-lift system, the thanks of the members of the Association are due to Mr. Richardson for the elaborate tabulated details of the trials made with the plant installed at his works, a description of which formed the basis of his paper. An idea seemed to prevail that the author had brought forward his paper in order to advocate the air-lift system. This was quite an erroneous impression. The ordinary plant at Birkenhead is about forty-five years old, and additional power was needed. After careful inquiry into the capabilities of the air-lift system, the Corporation decided upon adopting it. Speaking as a member of this body, Alderman Bloor confessed that the system had not fulfilled their expectations. At the same time, they believed they had plant which was as efficient as could possibly be produced. These were general remarks; but they were scarcely definite enough for men confronted with the problem of providing an additional quantity of water. Mr. Richardson, however, told his colleagues exactly what the plant could do; and it will be found at the end of his paper. The cost of working for 17 months was £3342; being at the rate of 2·52d. per 1000 gallons pumped to a head of 350 feet. In view of these

figures, it is scarcely to be wondered at that Mr. Ashton Hill, having, as he said, a dividend to earn for his Company, had "looked away" from the system, seeing that the same amount of work could have been done for about £700. Mr. Richardson, in his reply, acknowledged that the plant was not economical; at the same time he thought that no true comparison could be made, owing to the age of the other plant. Indeed, according to Alderman Bloor, the water lifted by air was not costing the Corporation more that it did elsewhere. Mr. J. H. Crowther, of Wallasey, on the other hand, stated as the result of his experience, that the air-lift system could not be worked so economically as good steam plant. Even in America, where the system has been adopted, it is pretty generally understood to be convenient rather than economical. The "conclusion of the whole matter" appears to be that certain special circumstances may justify the installation of the plant—for example, as was pointed out by Mr. Little Simpson, where an engineer is tied to a position, and must get an additional supply from his well; but it is not economical in comparison with good high-class pumping plant.

Inauguration of the Welsh Water Supply for Birmingham.

In the short space of four days last week, the heads of the Royal House of this country identified themselves, by their presence, with several movements which cannot but have an important bearing upon the social and industrial position of the nation. They took a prominent part in the schemes for the provision of a cathedral for Liverpool and extended dock accommodation for Swansea; they inaugurated the first instalment of the works by which Birmingham will be furnished with an additional supply of water from Wales; and they opened the new Centennial Hall of the Royal Horticultural Society in Westminster. Of these four ceremonies, that which was performed on Thursday amid the picturesque scenery of the Principality with which their Majesties were for so long associated (an account of which is given elsewhere) is, of course, the one possessing most interest for our readers. It marked the accomplishment of a great undertaking which engineering prescience years ago declared to be possible, and of which more recently the demands of a rapidly growing population necessitated the execution. When there were only about 250,000 persons in Birmingham, their wants were easily supplied from wells and local sources; and, as the number increased, the Birmingham Water Company, which was established in 1831, did their utmost to meet the additional calls that were made upon them. In this, it is acknowledged, they were fairly successful; and it must be recorded to their credit that in 1853—more than half-a-century ago—they readily complied with a request made by the local authorities, and introduced the constant supply.

The time came, however, when the conviction forced itself upon the public mind that the gas and water works should be in the hands of the Corporation; and our readers do not require to be reminded that the conspicuous personage in the achievement of this object was the statesman who has figured so prominently before the public of late years in connection with our Colonial policy and the fiscal problem which has arisen out of it. It was in 1875, during the mayoralty of Mr. Joseph Chamberlain, that the water-works were acquired; and a few years' experience of their management was sufficient to show that they would soon be quite inadequate to supply the continually increasing demand. Extensions were carried out from time to time; but eventually the conclusion was arrived at that something of far greater magnitude was called for. The result was that an enterprising Municipality, backed by an almost unanimous vote of the burgesses, determined that the dream of the Engineer should be realized. It lasted more than ten years, but what followed the turning of a little wheel by the King on Thursday was a proof of its realization. Once more civil engineering has justified Tredgold's definition of it, and has directed "the great sources of power in Nature for the use "and convenience of man." It has necessarily been a costly work—more costly than was at first anticipated. But Birmingham will willingly bear the burden, for the sake of the inestimable blessing it will enjoy of an adequate supply of pure water—not immediately, but in the very near future. We heartily congratulate all who have been concerned in the carrying out of works which evoked so many eulogistic remarks from the King in the course of his inspection of them.

A SERIOUS MENACE TO GAS COMPANIES' INTERESTS.

Attention has been directed by Messrs. R. W. Cooper and Sons, of Victoria Street, Westminster, who, as Parliamentary Agents, watch, on behalf of the Gas Companies' Protection Association, all proceedings in Parliament which affect the interests of the members, and direct any militant action which may be taken in connection therewith, to a matter of superlative importance to gas companies—attacking, as it does, their interests in a far-reaching manner as ratepayers. It is necessary to write pointedly on the matter in order, first, that the gravity of the suggestions laid before us by Messrs. Cooper may be fully appreciated, and, secondly, that gas companies may see in it a "call to arms" and to action. In our "Electric Lighting Memoranda," we have, the past two or three weeks and again to-day, been dealing with certain clauses of the Supply of Electricity Bill; and it has been shown that, in this measure, the Gas Companies' Protection Association have (though they were not successful, owing to reasons explained elsewhere, on all points for which they were contending) secured protection for "gas undertakers" generally against the compulsory acquisition of land by electricity undertakings which, at the date of the first publication of the notice for an Electricity Order, may be used or authorized to be used for gas-works purposes. This gives us an opportunity of once again commending to gas companies the Association as worthy of support; for, if ever there was a time more than any other when gas companies needed a wary guardian of their interests at Westminster, that time is now. With the Board of Trade succouring and defending electricity suppliers at every turn, and the Municipal Corporations Association alert, active, and powerful on all matters affecting municipal interests, every endeavour must be made to meet and, if possible, counteract all movement that assails, or is believed to assail, the rights and interests of gas companies. This can only be done, through the co-operation and service of some Association immediately in touch with parliamentary doings at Westminster. The Electricity Supply Bill is a case in point.

Now for the matter which is the subject of this article. It grows out of the Bill referred to, and it has a connection with the Private Legislation Procedure (Wales) Bill, the report of the Committee on which was only recently referred to in these columns. There is, Messrs. Cooper point out, a closer connection between that report and the Electricity Supply Bill than appears on the surface. The report recommends some extension of the Provisional Order system; while the Electricity Supply Bill anticipates it, but, be it observed, only in favour of the electrical industry. Possibly the time was when we among others may have been rather favourably inclined towards the Provisional Order system; but it is the prerogative of the Englishman not only to grumble but to change his views according to circumstances. Change of circumstance allows mutability of opinion. For some remarkable examples, reference has only to be made to the House of Commons. However, that is not the subject in hand. The Electricity Supply Bill is intended to give, and will give, largely extended powers to the Board of Trade in respect of Electric Lighting Provisional Orders. Now, however desirable it may be from the point of view of individual industries to be saved, by the short cut of a Provisional Order, the expense of going to Parliament for powers of more or less importance to their particular interests, there is no reason why Parliament should go out of its way to confer exceptional powers on one particular industry. But it may be argued that "it does not lie in the mouths of gas companies to say that this is bad in principle, because we might like it ourselves; and it is no argument against giving it to the electrical industry that we are not in possession of similar powers or similar advantages." But it is in defence of their own interests that gas companies must take a broader view of this devolution of Private Bill work, and that is from the point of view of municipal trading. By the Electricity Supply Bill, local authorities are, by Provisional Order granted by an indulgent Board of Trade, to have power to purchase compulsorily land outside their own district, to promote bulk supplies and power schemes, and to form Joint Boards, so that the ratepayers' money can be used for the purpose of allowing the authority in one district to associate themselves with another authority more or less speculative, and to engage in the establishment of large generating and distribution works and in the business of electricity supply in bulk.

Gas companies must look at the matter as one of supreme moment to them, both as suppliers of gas and as ratepayers. There is the opening in the Bill for a colossal extension of what was formerly possible in respect of electricity supply; and these enlarged possibilities may mean very serious competition for many gas companies. The cheapening of gas is the policy of to-day. With cheaper gas, its use for power purposes promises to be an important development. Therefore, is it not the duty of gas companies to see, if local authorities are to be allowed to engage in a branch of industry which may seriously compete with a coming development of their own, that those local authorities shall, at any rate, not be allowed to use the ratepayers' money for the purpose, unless there is a clear expression of desire on the ratepayers' part that their money shall be so used.

But what voice have the ratepayers under the Provisional Order system? Absolutely none. Parliament has exacted in the ratepayers' interests certain more or less stringent safeguards—when powers precisely similar to those now proposed to be granted by Provisional Order are sought by way of Bill. In the first place, the members of the local authority have to be called together by advertisement; so that the ratepayers have their opportunity of seeing what the Council are going to do. Then the ratepayers themselves have an opportunity of expressing their views at a meeting called under the Borough Funds Act, and can there and then either approve the Bill or reject it, or they can demand a poll. Further, the Bill when introduced into Parliament contains a recital of the estimates of the cost of the works on which the ratepayers' money is to be expended; and it also recites the fact that the requirements of the Act have been complied with. Still further, the resolution of the Council approving the Bill has to receive the consent of the Local Government Board; and there are various financial provisions inserted in the Bill as to the borrowing powers, the time within which the money is to be repaid, and the manner in which it is to be repaid. All of which shows distinctly that in past times (long before municipal trading in its present outrageous form was ever dreamt of) Parliament, at any rate in the case of Bills, took good care to protect the ratepayers—to ensure that not only should they have an opportunity of expressing their opinion on matters of this kind, but also that they should be fully apprised as to the nature and financial significance of that upon which they are invited to express their opinion.

Look on that picture and on this—"this" being the procedure in connection with a Provisional Order. In this case, no borough fund proceedings are applicable, the ratepayers and the Local Government Board are not consulted, and the Board of Trade ask no questions—in short, the Orders are handed over almost as a matter of course where there is no opposition. The only opportunity a ratepayer has of expressing his views at all is when the Local Government Board hold an inquiry respecting their sanction for a loan. But then—mark the distinction!—the inquiry is not for the purpose of determining whether the money should be raised, or of determining whether the powers of the Order should be carried into force, but solely for the object of settling how much money is to be spent. If a ratepayer goes into the room, and protests that the works in question are not wanted, he will be told that this is not the concern of the Local Government Board, and that (the Provisional Order having been granted) the only duty of the Board is to say how much money they should authorize for the objects in view.

All this bears very strongly on the Electricity Supply Bill. If there is to be this great devolution to a Public Department of powers now granted solely by Parliament, should not Parliament pause to determine whether this is not the time to say that ratepayers shall have as much protection under the Provisional Order system (which at the best involves a more haphazard and perfunctory sort of inquiry) as Parliament themselves have bestowed on the ratepayers in the case of a Bill?

This brings us to another matter for comment. It is this, that Parliament seems to have recently shown (anomalous as it may seem, having regard to the indignation aroused throughout the country against the ponderous debt contracted on account of municipal trading) less disposition to exercise the old solicitude for the ratepayers' interests. Only last year—in 1903—Parliament, at the instance of the Municipal Corporations Association, passed a new Borough Funds Act, under which (incredible as it may appear) parliamentary and joint-stock companies have been absolutely disfranchised for the purposes of the Borough Funds Act. It is an Act ostensibly passed in the interests of the ratepayers; but by the substitution of the word "electors" for the words "owners and ratepayers of the district," as under the Borough Funds Act, it is likely to work untold mischief. In consequence of this alteration of the law, gas companies, and indeed all companies, whether parliamentary or not, have been deprived of their votes against any wild-cat scheme promoted by a local authority. Until 1903, they had a vote; and a case comes to mind in which it proved very useful. That was the triple scheme of the Swansea Corporation, the components of which scheme were electric lighting, dust destruction, and a tramway. There the Swansea Gas Company exercised, with excellent effect, the power which they no longer possess. The Gas Company claimed their votes; and they were able to take a very active part in organizing other large ratepayers (among whom were a good number of trading companies) to take an active part against the scheme. In the end, the Bill was thrown out on irregularities in the Borough Funds proceedings, amounting to what was tantamount to a fraud on the ratepayers. The Committee of the House of Lords actually went to the length of considering the question as to whether they should not give the Gas Company and the other opposing ratepayers their costs. That is an instance of how the ratepayers' vote was used with, very properly, destructive effect. Whether there is any connection between this case and the Borough Funds Act of 1903, we do not know. It may have been one of the incentives to the introduction of that Bill, because—whether designedly or not—the measure has had the effect of rendering it absolutely impossible for a gas company, or any other company, to repeat the effective action that the Swansea Gas Company took on that occasion. Bearing this in mind, and having regard to the fact that it is nowadays the fashion of large trading concerns to register themselves under the Joint-Stock Companies' Acts, it will be seen, without further discussion of the point, that the local authorities are doing their utmost to get rid of the risk of opposition by just those ratepaying interests who, by their wealth and organization, are most able and fitted to raise a formidable barrier to their trading projects. Opposition to the plans of local authorities, under the Borough Funds Acts, is now left solely to individual ratepayers. It is, however, a trite but true saying that what is everybody's business is nobody's business.

It is bad enough that gas and other companies should, by law, be allowed no voice in the election of those who are to spend their money—that is to say, that those who contribute most to the deficiency resulting from the carrying on of any particular form or branch of municipal trading have absolutely no control over the expenditure, but to be deliberately and wantonly deprived of the check on the spending authority that the old Borough Funds Act gave them is sheer injustice.

The Private Bill Procedure (Wales) Bill has imported another phase into the question. This Bill, as we have already shown, recommends an extension of the Provisional Order system; and, as previously remarked, the Electricity Supply Bill has anticipated the report by (if it goes through) authorizing a large devolution of the powers of Parliament to the Board of Trade in the interests of the electric lighting industry. Now, Messrs. Cooper and Sons submit, in calling our attention to this matter, that, on the broad question of principle, if Parliament is going to authorize any extension of the Provisional Order system, it should be done by a General Act in which proper safeguards can be inserted for the ratepayers' protection, and which would be applicable to all future Provisional Orders. Here in the Electricity Supply Bill is a concrete case of a measure authorizing this devolution in a particular instance; and it is for gas companies and other large ratepayers to make the best of the opportunity to get a ratepayers' clause inserted. The Gas Companies' Protection Association have made one attempt; and the manner in which that attempt was frustrated is described in our "Electric Lighting Memoranda." The Bill has yet to go to the House of Commons; and what is wanted is a very strong backing from the gas companies of the country. In Committee, amendments affecting serious questions of principle will not be permitted to be raised; and they can only be dealt with when the Bill is introduced into the Commons, or when it is in Committee of the whole House. Let gas companies consider this: If the Bill goes through as now drafted, with the large extension of powers conferred on the Board of Trade—powers that would, under former conditions, have had to be dealt with in the ordinary course by Parliament—local authorities will, in respect of future Electricity Provisional Orders giving them an undue range in speculative electrical trading, be under no necessity to consult the ratepayers, simply because Parliament has not passed an Act prescribing the general conditions under which there is to be this Provisional Order devolution. Surely the clear duty of Parliament is to defer passing this particular Bill (if it is desirable to pass it at all) until they have retrieved, by an amending Act, the blunder of last year's Borough Funds Act, and shall have prescribed, in effect, the same safeguards in the interests of the ratepayers under any extension of the Provisional Order system as ratepayers have under Private Bill procedure. Failing this, Parliament should insert in each Bill authorizing an extension of the Provisional Order system—for example, in the Electricity Supply Bill—a rigorous ratepayers' clause.

On the general question, there is another aspect which is open to consideration and discussion, and that is as to whether there is really any advantage in devolution to the Provisional Order system in the interests of gas companies. It is a matter upon which a hasty opinion should not be given. On the face of things, it would appear that the industry would lose by such devolution—especially under present conditions of competition—more than it would gain, even where the ratepayers had proper protection. It would certainly facilitate the trading propensities of authorities. It would be so easy for them to say: "Let us go in for an electric lighting scheme here, or a power scheme there; the Orders will cost us very little." Even if the authorities have to get the ratepayers' consent, the eventual unfair competition between municipally financed business and private enterprise would be the same. Looking at the matter from all sides, the gas companies of the country should certainly concentrate their attention on pointing out distinctly their objections to this devolution in respect of its menace to the exercise of control by the ratepayers, and the easy road it offers to municipalities for doing that which has brought local debts to such fearful and almost incomprehensible magnitude. For much of this ruinous extravagance, no doubt, the Provisional Order system is to blame; and the proposed extension of the system, instead of acting as a resistance to that extravagance, will only foster it, if proper protection is not applied. There is this to be said for the present system of Private Bill procedure—that it does give a double inquiry, the disadvantages and advantages of which are found to cut both ways for both promoters and opposition. The power of the municipal interest in the House of Commons is considerable; and there is a great deal of wire-pulling in connection with it—as witness the proceedings recently on the Tyneside Electrical Tramways Bill. Small wonder, in view of this power, that Parliament appears to be so indifferent regarding the loosening of the ratepayers' grip

that is now proceeding. Gas companies should wake up to these matters; and, if there is to be this further devolution, they must do their share in seeing that the ratepayer holds as large a check as possible on the local authority. This is assuredly a matter over which some concerted action should be taken; and at the same time an effort should be made to get removed the disability imposed on companies by the Borough Funds Act of 1903.

As bearing upon the foregoing article, the following paragraph published in the *Daily Telegraph* yesterday is of interest:—

A Rating Injustice.—It is an axiom of the rating authorities that those who "pay the piper" should have a share in "calling the tune." But the West Ham Municipal Alliance has called the attention of the Home Secretary to the anomaly that many of the largest ratepayers in the borough are altogether deprived of voting power. Ten firms can be named which, at the rate of 10s. in the pound, pay over £20,000 a year to the rates. So long as they remained in private hands, these firms held between them forty-three votes. Correspondents now call our attention to the fact that directly they became incorporated, but still private concerns, the parties forfeited all claim to check municipal expenditure, which, whenever a Socialistic majority gets into power, is a growing factor.

WARNING THE MUNICIPALITIES.

From the Chancellor of the Exchequer downwards, there has of late been no lack of people who have considered it their duty to play the part of "candid friend" to our municipalities, and to point out the injury, not only to their particular constituents, but to the country at large, that is being done, and is bound to continue to be done so long as no curb is put upon the present tendencies. In addition to all this good advice and the many warnings of the danger that lies ahead, there has, of course, of recent times been another (and far more potent) influence at work in the direction of moderation. But though the all-important question of "ways and means," in forcing itself more and more to the front, is doing so much to emphasize the gravity of the situation, there still remains a great deal to accomplish in the matter of rousing most of the citizens and many of their representatives to a proper sense of their responsibilities. To this end, both individual and collective effort is needed—and is, we are glad to see, being heartily accorded—on the part of those whose position and whose experience entitles their opinions to respect. Surely it is a significant commentary on the existing state of affairs when such well-known men as Lord Avebury, Lord Brassey, Sir Gilbert Parker, M.P., Sir Charles Fremantle, and the Hon. Charles N. Lawrence (of the London and North-Western Railway Company) feel impelled to raise their voices on behalf of an Association formed to protect the interests of that private enterprise which they believe to be necessary to the well-being of the nation. All these, and other public men, delivered well-reasoned speeches at the annual meeting of the Industrial Freedom League which was held last week. It is, of course, not possible for us to take notice here of all that was said on the occasion referred to; but it will be of interest to give a brief outline of some of the arguments adduced.

The first point touched upon by Lord Avebury (who, it will be remembered, is the President of the League) was the recent parliamentary return relating to the indebtedness of local authorities, which, as has already been stated in the "Journal," has increased in eight years (from 1893-4 to 1901-2) by £141,933,184. In addition to the gravity of the situation thus created, the financial results of the business undertakings conducted by municipalities, as regarded profit and loss, was, he said, by no means easy to ascertain with any accuracy, owing to the figures being put in a form which (though not wrong) was very complicated, and in some cases misleading. Besides this, as a whole, no sufficient allowance was made for wear and tear and depreciation. On the subject of the assessment of municipal undertakings, he quoted the statement of the Secretary of the Newport Ratepayers' Association, that in his borough the electric lighting undertaking of the Local Authority (costing about £100,000) was rated at £432; while it was sought to assess the local Gas Company, with whom the electricity works were, of course, in competition, at twenty times this amount. As the Overseers of the parish were nearly all members of the Council, the largest ratepayer in the borough was, under the existing system, practically allowed to assess his own property. His Lordship next gave instances of the totally new directions in which the trading operations of municipalities are now tending to break out, and said that the country had unfortunately drifted into a position in which in many places the principal ratepayers had no voice in, or control over, the expenditure, while another regrettable result was the check administered to private enterprise. He concluded by quoting the following remarks from a speech made by Mr. Balfour in the House of Commons last March, on the subject of wages paid in Government factories and shipyards: "One of the dangers to which this House, and also the municipalities are opposed, is that electoral pressure may be brought to bear upon us and them to modify the rate of wages, possibly to the advantage of employees, but on the whole to the disadvantage of the great body of the workmen in the country."

In the course of his speech, Sir Gilbert Parker, M.P., warned his hearers that the dangers that had followed State trading—the ownership of railways, &c.—in Australia would inevitably follow municipal ownership here. The same pressure that was brought to bear to increase wages, &c., in regard to State ownership, was also brought to bear—and would be more and more as time went on—in the matter of municipal ownership. For a great many years—for a great many generations—this country and other countries speaking the English language had sought to free themselves from the effects of private monopoly. If monopoly was a bad thing in the hands of private individuals, the same dangers would exist if it were in the hands of public institutions or governments. A municipality desiring to secure certain results (say, to obtain profits for the relief of the rates) and thereby to fulfil their promises to their constituents, would do as a great many had done already when private enterprise was in question in competition with their own commercial organization—that was, prevent such competition from being put into practice—thereby crippling private enterprise and deducting just so much from national energy and national initiative. It was a national question; for they had to face not municipal trading alone, but Municipal Socialism, which had never yet been accepted by even the most democratic communities in the world. He corrected himself, however, and said there was one exception—Australia. There an example was to be seen in State life of what would be the result of municipal trading in municipal life.

After admitting that certain services—such as sanitation works, water supply, street improvements, &c.—should be under municipal control, Lord Brassey remarked that the local authorities were not working within their proper sphere when embarking on speculative undertakings which could only be managed successfully by those who had special knowledge, and could give their undivided time to the business. Unless such concerns (if under municipal control) were worked on a large scale, it was, he said, evident that the community generally did not benefit; and if they were operated in a big way, it was equally evident that, unless the management was good, the interests of the ratepayers would be gravely jeopardized. Works of this kind must be kept perfectly up to date; and he very much questioned whether under municipal administration there would be that readiness to replace existing machinery by something better, which was absolutely essential if success was to be achieved. Then there was another most necessary condition to success—there must be unceasing vigilance and watchfulness over all possible economies. Was it, he asked, reasonable to look to municipal administration for this minute supervision? Then there was the effect of municipal control on private enterprise to be duly considered. Herbert Spencer well said that every extension of the sphere of public action meant the discouragement of private action; and it was practically certain that if the public were to have the full advantage of expert knowledge and that minute care which personal interests could alone introduce, they must look rather to private than to municipal enterprise.

Another interesting speech was that made by the Hon. Charles N. Lawrence, who pointed out very plainly the effect that the enormous municipal expenditure had on private undertakings. He said that the London and North-Western Railway, which was about the largest ratepayer in the kingdom, handed over in rates and taxes £600,000 a year, or equal to a dividend of 1½ per cent. on the ordinary stock of the Company. Those who imposed this burden really paid but a very small proportion, and had little practical experience in the management of the great undertakings they were taxing. They knew that the credit of the country had been brought down to a basis of £3 4s. per cent.; and if the State and the municipalities, under the Trustees Act, could only borrow at this rate, private undertakings, which could not secure money on the same terms, could not afford to embark on capital expenditure. The result of this was far-reaching, and in the case of his Company was exemplified by the loss of employment to a great number of men. To his mind, the only solution of this national question was for Parliament to limit the borrowing powers of municipalities, at all events under the Trustees Act. Then when they had reached this limit, they would have to borrow as commercial undertakings in competition in a fair field with private enterprise. Another thing he thought should be earnestly considered was the disfranchisement of municipal employees.

Several other speeches in the same strain were delivered; and among the resolutions passed was one urging upon the Government the importance of carrying into effect the report of the Joint Select Committee on Municipal Trading of 1903, and of appointing either a Royal Commission or a Joint Select Committee in order to complete the work of the Select Committees of 1900 and 1903 by the issue of a report on the whole question of municipal trading.

Gaslight and Coke Company.—We learn from the Secretary of the Company (Mr. H. Rayner) that the accounts for the past half year show that (subject to audit) the balance to the credit of the net revenue account will enable the Directors to recommend the payment of a dividend at the statutory rate of £4 8s. per cent. per annum, carrying forward a balance of £273,975 19s. 9d. to the next account. This result compares with a dividend at the same rate for the June half of last year, and with a balance then carried forward of £116,530 3s. 6d.; being £157,445 16s. 3d. less than the present balance.

ELECTRIC LIGHTING MEMORANDA.

The Electricity Supply Bill—A Slight on Gas Companies—Spurning the Ratepayers' Control—Municipal and Company Antagonism—Parliament and Electrolysis.

THE Committee of the House of Lords who were charged with the consideration of the Supply of Electricity Bill upon which comment has been made in the "Memoranda" in recent issues succeeded, by the exercise of somewhat irritating brusqueness, in getting through their work early in the afternoon of Monday last week. The Bill was reported to the House the same day, and was forthwith ordered to be printed. The Committee appeared to regard it as a proper thing that the consideration which they gave to the questions before them should be measured rather by time than by their importance. Indeed, their conduct throughout was such that those present could hardly resist the notion that the task committed to the members was one of an uncongenial and an irksome nature. It was rather a strange thing that to Lord Wolverton should have been entrusted the duties of the chair on a Bill promoted by the Board of Trade, inasmuch as upon him falls the duty of looking after the interests of that Board in the Upper House. In this inquiry (such as it has been), this pet Electrical Bill of the Board, which puts into their hands unusual legislative powers, has not by any means suffered in their eyes; and for this perhaps Lord Wolverton more than any other member of the Committee should be thanked by them. The treatment meted out to the petitioners for amendment at the sitting yesterday week was not such as one can fairly bring within the definition of judicial, as we shall more particularly show presently; and it can only be hoped that, when the Bill reaches the Commons, whatever may be the objects of those who appear before the Committee, their pleadings will receive the consideration that they have a right to expect in connection with matters of such public importance.

One pernicious effect of the Bill is, if it becomes law without amendment, that it will enable local authorities to run riot and indulge in all sorts of excesses in the field of electrical venture without obtaining the consent of the ratepayers, as they would have to do in the case of the promotion of a Bill. This is a matter that is dealt with at some length in an article appearing elsewhere in this issue; and there we have tried to point the seriousness of this to gas companies. The Gas Companies' Protection Association, through their Counsel and Agents, sought to correct this violation of the ratepayers' power of veto, by submitting to the Committee a clause providing for, as far as possible, its restoration, by securing, in the initial stages of an Order and the proposed exercise of its powers, a clear expression of the views of the ratepayers, and by furnishing them with complete financial estimates. In short, the intention of the clause was to do something towards placing the ratepayers in the position they enjoy in the case of the promotion of a Bill by their local representatives. There is something singular and incomprehensible about the discourteous treatment this clause received. When it was introduced to the attention of the Committee at the sitting yesterday week, although it was handed or sent in a week or ten days previously, the Chairman denied all knowledge of it, and suggested that, if it had been received, it had been lost. Thereupon fresh copies were handed round to the Committee. Without, however, even doing it the honour of reading it, they brushed it aside in a manner ungracious and equally undignified. Such a clause would not have been to the taste of either the Board of Trade or the municipalities. All the Chairman said, after observing the sidehead, was that "this is contrary to the principle of Parliament." If it is the principle of Parliament to suppress the voice of the ratepayers, then the sooner the ratepayers let Parliament know what they think of it, the better for the country generally. It is to be hoped that this rebuff will not induce the Association to discontinue their efforts in this matter.

The Association, as stated last week, have scored one valuable success in connection with the Bill; and, in addition to this and the ratepayers' consent clause, they were proposing to contend for the insertion of a general electrolysis clause. The discouraging attitude of the Committee, however, caused them to desist. It was felt that there would be little chance of getting such a clause through; and, therefore, it was preferred, under such unfavourable prospects, not to imperil a future opportunity by an adverse decision. This was a prudent course. Respecting the exemption which was gained for gas companies generally from the operation of the compulsory acquisition of land clause, on the suggestion of the Board of Trade the word "undertakers" has been substituted for "companies;" so that now the exemption will apply to land in the possession of gas departments of local authorities as well as to that owned by gas companies. The protection is worth having; and gas undertakings generally should note to whom they are indebted for it. Gas companies will, however, regret that good fortune did not attend the proposed correction of the neglect of the Board of Trade in the two other respects mentioned above. Perhaps there will be better luck next time. We hope so.

Meanwhile the discussion of clauses has revealed the respective positions of both the municipalities and the electrical companies. Though arrayed in opposition with the gas companies, their objects were all, of course, dissimilar; and it was interesting to see how the municipalities and the electrical companies fought tooth and nail in order that no power should repose in the Board of Trade that weakened their relative positions. The municipalities did not want the Board to have the power enabling electricity companies to supply in bulk to any local authority, company, or person in any area, nor were the companies anxious that the Board should be allowed to permit a local authority to supply another authority, or to enter into joint schemes with other authorities. The increased latitude that the Board are asking in the matter of dispensing with the consents of local authorities in the case of the issue of Provisional Orders to companies was also, of course, vigorously opposed on behalf of the municipalities; but the fact that the Bill enables the latter to go for extraordinary powers, by means of Provisional Orders, without the consent of the ratepayers was hidden away in the background. Ratepayers should note that what is good enough for them is not good enough for the municipalities. But the Board in this matter came out on top; and so will be able to exercise their discretion with greater freedom than hitherto when the local authorities decline to assent to an application for an Electric Lighting Provisional Order by a Company. All the same, regarded from the standpoint of municipal gas undertakings, it is a questionable enlargement of the powers of the Board.

It is with much satisfaction that we learn that the Unopposed Bills Committee of the House of Commons, of which Mr. J. W. Lowther is Chairman, have set their faces against the austere exercise, in a matter of great importance to the gas industry, of the autocratic power possessed by the Chairman of the Lords Committee. With unaccountable eagerness, his Lordship has hitherto effaced from Electricity Bills all clauses dealing with electrolytic action. In this, he appears to have been acting completely under the thumb of the Board of Trade. He apparently loses sight of the fact that, in (we think we may say) all cases in which these protective clauses are inserted in unopposed Bills, they represent the price of the withdrawal of opposition, and that those Bills would have been contested through the Houses had the clauses not been incorporated. His Lordship must see the injustice which his action occasions by defeating the rights of opposition. Sir Chandos Leigh, the Speakers' Counsel, has not overlooked this particular aspect of the matter; and he drew the attention of the members of Mr. Lowther's Committee to it when the Lowthians Electric Power Bill came before them just recently. He did this notwithstanding that the Board of Trade had sent him a letter "begging" that no special electrolysis clause should be included in the measure. Let us trace the history of the clause in question. It was originally inserted in the draft Bill by agreement between the promoters and certain County Councils, the Edinburgh Corporation, the Edinburgh and Leith Corporations Gas Commissioners, the Edinburgh and District Water Trustees, and the Water of Leith Purification and Sewerage Commissioners. The Lords Committee deleted the clause. The promoters re-inserted it for consideration by the Commons Committee; and, after what Sir Chandos Leigh and others said, it was allowed, subject to slight modifications. What the Chairman of Committees of the Lords would say, was then open to much speculation; and the expected has happened. When the clause was again submitted to Lord Balfour, his Counsel struck it out. But the good news comes from Mr. W. R. Herring that the Clerk to the Gas Commissioners (Mr. James M'G. Jack) has informed him that there has been a meeting with Lord Balfour, and, after further discussion, he has permitted the clause to be re-established. Dogged perseverance has again won. The next wonder is, What will the Board of Trade say? The clause is in the following terms: "The Company shall make full compensation to the county authorities and other public authorities respectively for all loss or damage which may occur to the roads, streets, bridges, sewers, drains, water and gas main pipes, apparatus, or other property of such authorities respectively, consequent upon, or arising from, the exercise or user of any powers by this Act conferred upon the Company, including damage due to, or arising from, electricity escaping from the mains or other works of the Company."

Reductions in Price in London.—The Directors of the South Metropolitan Gas Company last Wednesday decided to reduce, as from Midsummer, the price of gas by a 1d.; making it 2s. per 1000 cubic feet. Two days later, the Board of the Gaslight and Coke Company determined to make, as from the 1st inst., a similar concession to private consumers in their district North of the Thames.

Utilizing the Waste Heat of Gas-Engines.—At the summer meeting of the Institution of Heating and Ventilating Engineers, held in Liverpool last Thursday, a paper was read by Mr. George Chasser, of Stourbridge (who was awarded the first prize in the assistants' competition last year), entitled "An Inquiry into the Waste Heat from Gas-Engines, with some Suggestions for its Useful Application." He pointed out that the increasing use of gas-engines made it important that, where possible, the waste heat should be utilized, though little had been done in this direction. He said that in a 50 brake horse power engine, tests showed that only 18 to 25 per cent. of the calorific power of the gas admitted to the engine was used up in mechanical energy—the remainder going to waste. He made some suggestions for using this wasted energy.

BUTTERFIELD ON GAS MANUFACTURE.

THE scope of chemistry in connection with gas manufacture is a different thing from what it was in the days of Mr. Lewis Thompson, whose pamphlet of 98 pages, and appendix, reprinted from the "JOURNAL," is before us as we write. The five heads under which the subject is treated in this pamphlet appear to us to be as comprehensive to-day as they were undoubtedly considered to be forty-four years ago; but they have been greatly extended in detail, and retort-furnaces, carburetted water gas, and other enriching processes, now furnish additional subjects for investigation. A tangible proof of this is the compact and closely-written volume of 244 pages, and index, which forms only the first part of a third edition of the well-known work by Mr. W. J. A. Butterfield on the "Chemistry of Gas Manufacture."* We gladly welcome this volume, though with some slight misgivings as to the effect, upon such of his readers as consult it as a "practical handbook," of the mass of information which it contains. Mr. Butterfield has proved himself to be a diligent student of current literature on the subject; and notwithstanding omissions here and there, his book will be found to repay careful study.

In Chapter I., the author deals with "The Raw Materials of Gas Manufacture," though why wood gas should be included under this head, it is hard to say. Nor is cellulose of more than academic interest in this connection. Coal is dealt with somewhat briefly at the commencement of the chapter, and further on at greater length—a division which hardly seems necessary, and may be attended with inconvenience. The analyses of coal and coke are treated fully; and the practical testing of coal for yield of gas is also described. The author favours the employment of an apparatus in which the 1-100oth part of a ton may be carbonized—a size which is very generally employed, though we should hope it is not found necessary to make at least six tests with each sample of coal under investigation, as recommended by Mr. Butterfield. Nor should it be requisite to have recourse to further tests to be made on "an ordinary working scale," with a small plant "consisting of six full-sized clay retorts," and furnished with the usual complement of scrubbers, exhausters, purifiers, &c." To our mind this is "admirable fooling"—a waste of time and money. Enough should have been learned of the coal by means of a small experimental retort to determine whether or not it is worth while to give it a practical trial on the gas-works, upon its suitability for which the choice must finally rest. Too much time and attention may easily be given to testing—a remark which applies more or less to almost every branch of gas manufacture. The author has not pointed out one essential condition to the obtaining of comparative results—namely, that the temperature down to which the gas is condensed should be uniform. The same coal will produce the most varying results if the temperature of condensation be altered to any considerable extent. Under the heading of oil, the origin, production, distribution, and chemical composition, as also the method of examination, of petroleum are very fully dealt with. A remark as to the gradual failure of the supply of natural gas is scarcely consistent with the fact that, according to official reports, the yield of this gas in 1902 was in excess of that of any previous year, and that the number of gas-wells in use increased during that year from 12,865 to 14,254.

The next two chapters form the most important portion of the work, and might have been divided up with greater convenience to the reader. They are each of them headed "Coal Gas," and deal with the various methods for its production, purification, &c. There are references to the plant employed, which are (perhaps necessarily) somewhat weak; these being accompanied by illustrations, one of which (fig. 14), showing the end of a horizontal condenser, might easily be improved upon. In a work of this kind, it should be scarcely needful to deal with any but the typical features of the plant employed, seeing that it is not possible to treat of the latter thoroughly. The author himself offers a kind of apology for describing at some length the various sorts of drawing and charging machines in present use; his reason being that the manner in which they act has considerable influence on the results. He says: "It is essential to good carbonization, and rapid and thorough working off of the charge, that it [the coal] should be placed in the retort in a uniformly distributed layer, and, moreover, not compressed or compacted to any considerable extent." This is an axiom with which all must agree; but there will not be the same unanimity in regard to the following: "At the time of writing it does not appear to be established that the quite recently introduced projecting machines deposit the coal in the retort under as favourable conditions for good carbonization as does the charging scoop." This is a point upon which the author can scarcely have had any practical experience, and which is rather in the domain of the engineer.

Mr. Butterfield is more at home in his treatment of that which is within the province of the chemist—namely, the action in combustion furnaces and producers, and recuperation of waste heat, which, on the whole, is deserving of high praise. We do not remember to have seen these subjects treated with the same fulness of scientific detail—the whole of this portion of the book is highly suggestive, though perhaps a little marred by frequent references to Euchène and his work. The reference to the uneconomical effect of using an excess of steam for keeping the fire-bars cool is useful, though there is not much the matter with English practice in this regard. When speaking of regenerator furnaces, the author says that the charge against regenerative settings, that the saving in fuel is insufficient to compensate for the increase in the initial cost, "was well founded in the case of many of the more complicated systems, which involved a large capital expenditure." Surely the bottom was knocked out of this idea long ago. These settings were thought to be complicated when first introduced, because they were not understood; but the very same ones are among the most successful in use at the present day, with but little alteration. Then he says that those settings in which the generator is quite detached from the settings fell out of favour for a time, but are now being used again. This latter statement is hardly correct, though it is true that outside producers are now being used for heating several settings from one producer, of which, however, no mention is made.

There is a reference to inclined retorts, the Yeadon and Adgie revolving retort, and the various systems of vertical retorts; and the author then proceeds to deal with carbonization products and hydrocarbons, the distribution of sulphur in distillation products, and the quality and quantity of gas produced. In connection with the latter, he refers to the system of introducing into the retort a stream of inert gas as an accomplished fact, and as the best way of ensuring a high yield of gas from the coal undergoing distillation, &c. No mention, however, is made of the experiments at the Crystal Palace District Gas-Works for the purpose of determining the practicability of this very process—experiments which have, so far, not had any tangible result. For the calorific balance of the carbonization of coal, the researches of Euchène and Mahler are drawn upon. The first of these two chapters ends with a description of the composition of crude coal gas.

The opening pages of the next chapter are devoted to the impurities and noxious constituents of coal gas, which serve as an introduction to "Gas Purification," under which heading are described: The various methods of washing or scrubbing gas; tar-extraction; the removal of carbonic acid; the preparation and use of lime; testing chalk and lime; the removal of sulphuretted hydrogen; the action and purification value of ferric oxide; testing bog ore; Weldon Mud; &c. These subjects are treated in a full and interesting manner, following which is a description of the purifier and purifying house. We need not follow the author through the removal of carbon disulphide, or the preparation and nature of sulphided lime. Enough has been said to indicate the completeness of this portion of the work. The chapter closes with a very brief account of the attempts made to purify with gas liquor, in which there is no reference to the early work of Hills at the Old Kent Road Gas-Works, or the latest work in this connection of Mr. Thomas Holgate, at Halifax.

There are many references to cyanogen in these two chapters, but no description of the various methods—Foulis's, Bueb's, or the latest one of Chance's—in use for its extraction. Its removal by oxide of iron is, indeed, mentioned; and if it were true, as might be inferred from the author, that the whole of the cyanogen can be recovered from coal gas by oxide of iron purification, what need of further processes? It may be correct to say that cyanogen can be completely removed by oxide of iron; but the whole of it cannot be recovered. Further information on this subject is promised in the second volume of the work.

The fourth chapter deals with carburetted water gas, and the fifth with oil gas—both containing descriptions of the various processes in use. The sixth chapter treats of enrichment by light oils; and the concluding one of final details of the manufacture, and sundry schemes for making and enriching gas.

There are blemishes in the work, such as only very careful editing can avoid. It seems, for example, almost like affectation to use inverted commas for such a well recognized term as illuminating power. Carbon dioxide is sometimes spoken of, but more frequently carbonic acid. It would be more convenient if temperatures were uniformly referred to in degrees of Fahrenheit; while the structure of the work is scarcely attractive, and seems to lend itself to needless repetition. Compare, for instance, what is said on p. 41, with regard to the size of coke for use in a water-gas plant, with what is also stated on p. 199. Again, freedom from water as one of the essentials of a good gas-making petroleum is insisted on at p. 47, and again at p. 57. These, however, are comparatively small matters. We regard the work as one of considerable merit, and commend it with confidence as likely to prove a valuable addition to the library of everyone engaged in gas manufacture.

* "The Chemistry of Gas Manufacture," by W. J. A. Butterfield. Vol. I. London: Charles Griffin and Co., Limited; 1904.

Gas v. Electricity for Lighting College Buildings.—At the half-yearly general meeting of the College of Preceptors, held last Saturday, the Council, among other things, reported that they had had under consideration the question of substituting electricity for gas as the means of lighting the College building. They had made careful inquiries, and had come to the conclusion that, under the most improved methods of incandescent gas lighting an equal illuminating power could be secured at a considerably less annual cost than that of electric light. Having regard to this, and to the large initial outlay involved in the installation of the electric light, they had decided to adopt incandescent gas-fittings throughout the building. The recommendation of the Council on this matter was adopted.

JEAN PIERRE MINCKELERS AS THE INVENTOR OF GAS LIGHTING.

[COMMUNICATED.]

AN interesting feature of the recent meeting of the Dutch Association of Gas Managers at Maestricht, was the unveiling (by the representative of the Queen of Holland) of the statue of Minckelers, which has been erected by public subscription at the instance of Mr. P. Bolsius, the President of the Association, upon whom it is a satisfaction to note has been conferred the honour of the Order of Chevalier of Orange-Nassau. Minckelers is regarded by his countrymen as having been the inventor of gas lighting; but the shades of Murdoch and Lebon need not be greatly perturbed on that account, for their laurels are not seriously in jeopardy.

Jean Pierre Minckelers was a native of Maestricht, and became in the year 1772 Professor of Natural Philosophy at the University of Louvain. He was afterwards Professor of Chemistry and Physics at the Central School established by the Republican Government of France in his native town of Maestricht. While still at Louvain, in 1784, Minckelers was, with two of his colleagues, commissioned by the Duc D'Arenberg—one of the patrons of the University—to make a series of experiments in the hope of discovering some cheap and ready means of producing large quantities of permanent gas sufficiently light for aerostatic purposes. The Duc had become interested in the invention of balloons the previous year by Montgolfier. The experiments covered a great variety of substances; but attention was particularly directed to those which are easily procurable in quantity, and at a small cost. Such a substance, Minckelers tells us, in his "Mémoire sur l'air inflammable tiré de différentes substances" is coal, of which a small quantity was powdered, and distilled in a gun-barrel over a forge fire. The experiment was completely successful—"inflammable air" being obtained in abundance. Four ounces of coal yielded one cubic foot, which on weighing was found to be four times lighter than atmospheric air. Further experiments were made with different kinds of coal; and then Minckelers tried to make his gas still lighter by passing it through lime-water, but without any material result. He also tried (upon the lines of some experiments that had previously been made by Priestley) the effect of distilling at a lower temperature—namely, that of a wood fire, instead of the forge fire previously employed. This resulted in a smaller yield of gas, the weight of which compared with that of the atmosphere as 10 : 31. He likewise found, by collecting the portions separately, that the first portions of "air" yielded by distillation are heavier than those that follow; and he concluded from his experiments that, to obtain the lightest "air" from coal, and at the same time the greatest quantity, a high heat must be employed.

These researches place Minckelers in advance of previous experimenters in this direction; and he was the first to use coal gas for inflating balloons. Mr. Bolsius states in his "Notice Biographique de Jean Pierre Minckelers," that a tiny balloon filled with this gas was sent up from the grounds of the Duc D'Arenberg's chateau; and shortly afterwards from the same place a larger one. There is, however, nothing to indicate that Minckelers attached any particular importance to the lighting power of the gas which he distilled from coal, although it appears that in 1785 he lighted his lecture-room with it, and did so repeatedly in that and the following year. This is quite conceivable, because to exhibit this gas to his pupils would be a very natural thing for him to do. But for about thirty years afterwards—namely, until 1816—Minckelers continued in the active practice of his profession without, so far as can be ascertained, anything more being heard from or of him in connection with the application of this gas for lighting purposes. He seems, therefore, to have carried this matter—as regards its practical application—but little, if anything, further than where it had been left by Dr. John Clayton about a hundred years previously. Clayton says that he frequently lighted up his bladders of gas for the amusement of his friends; and Minckelers seems to have done very much the same thing. Neither he nor Clayton is on this account entitled to be regarded as the inventor of gas lighting as we in this country understand the meaning of the term. The real inventor was he who first demonstrated its applicability for general purposes.

THE CALORIFIC VALUATION OF GAS.

By H. LEICESTER GREVILLE, F.I.C., F.C.S.

In a recent article on the "Photometrical Valuation of Gas," alluding to the subject of calorimetry, I stated: "This much is at least certain—viz., that with coal gas and water gas, the calorific value decreases with the diminution of illuminating power." In using the term "water gas," I should have said carburetted water gas. It is perhaps a little premature to discuss the probability of calorimetry replacing photometry as a means of effecting a valuation of the public gas supply; but the subject is one on which a few remarks will be of interest.

It may be stated initially that prior to the development of the incandescent system of gas lighting, any question of a possible correspondence or ratio between heating and lighting values would have been considered foolish and impossible. Now the question has entirely changed. We have only to remember that the lighting function of gas, *quo ad* its use for illumination in ordinary burners, is totally destroyed, and a bunsen effect by due admixture of air supply substituted, before the most efficient results on the incandescent system are obtained, in order to truly recognize the fact that the more modern system of illumination is a pure function of heat. This is broadly true; but the ratio between the illuminative effect of gases of different qualities burned on the older and the newer systems of illumination has yet to be determined. The discrepancy is, however, so greatly in favour of the incandescent system, that comment with regard to this aspect of the question seems almost superfluous.

The cheapest burners available for the production of light are of the batwing or fishtail type, all having the disadvantage of not affording light equally in all directions—even on the horizontal plane. A low-class one of this type may possibly be bought for a penny, and a high-class one for sixpence. Even the highest class of this type can scarcely claim to develop 3 candles per cubic foot of 16-candle gas; while with a fall in the illuminating power of the gas, the efficiency of this class of burner rapidly decreases. When we come to argands, we have the advantage of an equal light in all directions on the horizontal, and a value of (say) 3·5 candles per cubic foot—a disadvantage, however, being the necessity for the employment of chimneys. They are an additional cost; and, unless they are kept scrupulously clean, they obstruct a large percentage of the light.

Now with regard to the incandescent system. For indoor illumination, no chimney is required; the light on the horizontal plane is equal in all directions; the price of a burner complete with mantle is (of a cheap but efficient make) about 8d.; and the light is at the very least from 16 to 20 candles per cubic foot of gas consumed. Mantles are cheap; and the cost for necessary renewals is in any reasonable case more than compensated for by the saving of gas consumption, leaving the immensely increased light as a distinct advantage. With higher class burners on the incandescent system, even more economical results may be obtained; any range from 20 to 40 candles per cubic foot of gas being ensured. So that, both in regard to private and public lighting, there is a capacity for light development undreamed of in the past, and capable of further progress in the future.

The inevitable conclusion from the march of science is that the present system of the valuation of gas on the old lines of pure photometry, as a balance of protection between producers and consumers, is utterly inadequate. We have arrived at a period in which probably 50 per cent. of the total gas manufactured is used for heating and power purposes. This is a pure question of calorific value. With regard to lighting, it is only a matter of time and experience for the incandescent system of illumination to replace the older and cruder methods of light development. In this case, the question will also be mainly that of the calorific value of the gas.

The estimation of the calorific value of a gas can now be made with absolute accuracy. I have used the three best known forms of apparatus, with little difference in the results, on many different grades of gases. I allude to the Junkers, the Dowson, and the Simmance-Abady. My main experiences have been with the last appliance. I regard calorimetric instruments as being as accurate as photometrical appliances for their special purposes.

As I have already stated, little is known between the ratio of heat and light values as estimated by calorimetry and photometry. The following figures will appear, however, to throw some light on the subject. They are quoted from Mr. Dibdin's book on "Public Lighting by Gas and Electricity," and are the mean of my experiments and those of others on coal gas.

Lighting Value. Candles.	B.T.U. per Cubic Foot.	Lighting Value Candles.	B.T.U. per Candle.
11·0 ..	500		
11·5 ..	514		
12·0 ..	530	11 to 12 ..	30
12·5 ..	545		
13·0 ..	560	12 ,, 13 ..	30
13·5 ..	576		
14·0 ..	592	13 ,, 14 ..	32
14·5 ..	607		
15·0 ..	623	14 ,, 15 ..	31
15·5 ..	638		
16·0 ..	652	15 ,, 16 ..	29
16·5 ..	667		
17·0 ..	682	16 ,, 17 ..	30
17·5 ..	698		
18 0 ..	714	17 ,, 18 ..	32

Of course, while the means for estimating the lighting values is not stated, the heat values are no doubt correct. The first two columns are from Mr. Dibdin's book; but the figures with regard to the ratio of illuminating value and heat units I have calculated. It will be seen that there appears to be in the case of coal gas a definite ratio between photometrical and calorific value. Quoting from the same publication, water gas is credited with a heat value of 435 B.T.U., while carburetted water gas is assigned a value of 470 B.T.U. Unfortunately, the lighting power is not stated; but 20-candle water gas possesses, to my own knowledge, a calorific value of about 620 B.T.U. There is no doubt that carburetted water gas conforms to an increase of light with increase in the

illuminating power; but in the same ratio as coal gas. Water gas is, however, for obvious reasons, not likely to supplant coal gas for the public gas supply to act as an adjunct.

In offering the above remarks on the ratio between photometric and calorimetric value, I do not intend to seriously propose at the present time that calorimetry should replace photometry, but simply to show that the question is ripe for serious consideration as to what may be possible in the future.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 282.)

THE *Malacca* incident, which was of a magnitude to agitate the whole country, was, of course, the centre of disturbance on the Stock Exchange during last week. But before it burst upon us, the markets were already in a ticklish condition, owing to the state of things in the Money Market. So that altogether it has been a highly-strung week; but happily the general feeling was calmer and steadier at the close, owing, in the main, to political reassurances. The Money Market was unusually sensitive, not only varying from day to day, but fluctuating sharply in the course of the day. The tendency was firm at the close; and the stringency is not likely to relax until the turn of the month. Discount rates ruled very firm. Business in the Gas Market was in the aggregate a good deal quieter; transactions in the biggest issues showing a marked reduction. This was in some measure redressed by greater activity in other issues which are usually quiescent. The tendency was firm and steady, and changes in quotation were both few in number and really slight in degree. In Gaslight and Coke issues, the ordinary opened with very fair promise; but business soon died away, and never thoroughly roused up again afterwards. The cheapest figure was 94, and the highest was the closing mark of 95¼. This was after the announcement of the Directors that the profits of the half year would enable them to pay the dividend and to carry forward some £274,000. These figures show an improvement in the financial position of £98,500 during the six months, and of £157,450 over the corresponding figures of this time last year; and they will no doubt be highly gratifying to the proprietors. The secured issues were firm and quiet. Another interesting announcement of the week was from the South Metropolitan Company, the Directors of which have reduced the price of gas to 2s. per 1000 cubic feet—an unprecedented price for the Metropolis.* It may be anticipated that the Company's accounts for the half year will reveal a strong position amply justifying this important step. The stock last week opened rather weak, aud the quotation was put down; but it was soon afterwards restored. There were no dealings in Commercials. In the Suburban and Provincial Group, there was more animation; Brentfords being particularly active. The only change in the London Market was a rise in British; but on the local Exchanges, Liverpool "A" advanced and Newcastle prices were fractionally modified. In the Continental Companies, there was hardly any business. The general tendency was firm; and European and Malta each had an advance. There was nothing to note in connection with the remoter undertakings. Dealings in the Water Companies were few and slight. The incident of the week was the House of Lords' decision adverse to the New River Company on the dividend limitation question. Thereupon there were a couple of transactions in the new shares at 320 and 330, followed by others at 318 and 319. The last transaction previously marked was at 391.

The daily changes may be briefly summarized. On Monday, European fully-paid rose ½. On Tuesday, British rose ½, and Malta ¼; but South Metropolitan was put down 1. On Friday, South Metropolitan was reinstated.

[* Since this was written, the announcement is to hand that the Gaslight and Coke Company are also reducing their price by 1d.]

Incandescent Alcohol Lamps.—An interesting communication on the above subject was recently made to the London Section of the Society of Chemical Industry by Mr. T. Tyrer, who has been for a long time advocating the relaxation of restrictions in this country on the manufacture and uses of alcohol for industrial purposes. In one type of lamp exhibited, called the "Amor," the light afforded is claimed to exceed, or at least to be equal to, that of an incandescent gas-light. In addition, it is stated that there is neither smell nor corrosion, unlimited durability of the mantle, and the quantity of spirit used is so small that the cost amounts to only one-sixth of a penny per hour with methylated spirit at 2s. 4d. per gallon. The lamp is started by pouring a little spirit on to a platform just below the mantle, and igniting it. The heat is conveyed to the wick-tubes, capillarity excited, the spirit vaporized, and maximum incandescence produced in less than a minute. No information was afforded as to whether these lamps are in the market. Though not comparable in cost of working with incandescent gas lighting, they would be very valuable under many conditions.

OBITUARY.

We regret to record the death, on the 3rd inst., in his 61st year, of Captain W. H. WHITE, of New York. Deceased, it may be remembered, had attended the meeting of the Western Gas Association and the Congress of the American Gas Associations at St. Louis, and had read at the former the paper entitled "Some Thoughts on Candle Power" which was noticed in the "JOURNAL" last week. On his journey homeward, he contracted a cold, and was subsequently seized with paralysis, to which he succumbed. Captain White, who was a consulting engineer and contractor, was the son of Colonel Ambrose J. White—a well-known figure among gas men in New York thirty years ago; and in deceased the teaching and practice of his respected father were fittingly illustrated. No other man in the gas industry was better liked than Captain White, particularly during the past twenty years. He was formerly connected with the old Citizens Gaslight Company of Brooklyn, and was a member of the Society of Gas Lighting (of which he was Secretary), the New England Association of Gas Engineers, the Western Gas Association, and the American Gaslight Association. The funeral took place in Greenwood Cemetery on the 6th inst., and was attended by a very representative gathering of friends of the deceased.

PERSONAL.

Last Thursday afternoon, the officials and employees of the Staines and Egham Gas Company presented Mr. THOMAS WEBB with a handsome marble clock and bronze horses, on his retirement from the position of Engineer and Manager, after upwards of 31 years' service. Mrs. Webb was also the recipient of a gold-mounted umbrella. The presentation was made by Mr. J. Baker, the oldest servant of the Company, who expressed the general regret at the great loss sustained by the employees. Mr. Webb, in returning thanks for the presentations, said he was sorry to sever his connections with his fellow-officers and workmen; and trusted he should be spared many years to appreciate the kindly feeling displayed by all. The clock bore the following inscription: "Presented to Mr. Thomas Webb by the officers and outdoor staff of the Staines and Egham Gas Company, upon his retirement as Manager after over thirty-one years' service. July 25th, 1904."

An interesting gathering took place last Wednesday, at the Star and Garter Hotel, Blyth, under the auspices of the Directors of the Blyth and Cowpen Gas Company, for the purpose of making a presentation to Mr. WILLIAM THOMPSON, to mark the eightieth anniversary of his birthday, and the completion of 25 years' tenure of the position of Chairman of the Company. After dinner, at which Mr. G. Dobson presided, Mr. J. R. D. Lynn, one of the Company's Solicitors, proposed "The Health of Mr. Thompson," who, he said, joined the Company as a shareholder in 1858, and was appointed a Director two years later. In 1879 he was chosen to preside over the deliberations of the Board, and, both as Director and Chairman, his services had been very valuable. The toast having been enthusiastically honoured, Mr. Lynn made the presentation, which consisted of a silver tea and coffee service, suitably inscribed, for Mr. Thompson, and a diamond brooch for Mrs. Thompson. On rising to acknowledge the gifts, Mr. Thompson was very cordially received. In the course of his remarks, he said that while his services might have been of some use to the Company, he should like to refer to the work the Managers and Secretaries had done. There had been four of each, and the Company had been indebted to them all, especially to their present Manager and Secretary, and to Mr. Ford, their Engineer, whose valuable advice had enabled them to undertake judicious schemes with invariable success. He was very proud of the honour done him by the presentations, and he heartily expressed his thanks for them. Other toasts were proposed, and altogether a very pleasant evening was spent.

MORE THOUGHTS ON CANDLE POWER.

There is a melancholy interest attaching to the paper read by Captain W. H. White at the annual meeting of the Western Gas Association, as given in abstract in the last number of the "JOURNAL," from the fact that it was his final word on matters connected with the industry with which he was identified. As will be seen by an announcement that is made above, on his way home from the meeting he was seized with illness which brought his life-work to a close. The paper, as may be remembered, was written in a pleasant vein, and we give below some of the remarks made upon it.

The President (Mr. F. H. Shelton) having briefly opened the discussion, Mr. A. E. Forstall remarked that when the question of richer gas than could be produced by ordinary coal-gas methods was brought before managers in America, it was almost absolutely necessary for them to make gas of a higher candle power in order to retain their business. Gas could only be burned economically in flat-flame burners. There was at that time no

other burner that could be given to the consumer that he would use. People would not have argand burners all over their houses, though they might be fixed in special places. The electric light had then just been brought into use; and its promoters were boasting that they were going to drive the gas companies out of business in three or four years. The way in which this competition could be most successfully met was by introducing higher quality gas, which could be made, candle power for candle power, more cheaply than the comparatively low-candle coal gas. It was no mistake of judgment for the gas engineers of that day to take the action they did under the conditions then obtaining. They existed no longer; but they did exist as late as 1892. His connection with the gas business did not go back quite so far as Captain White's; but he remembered testing one of the first Welsbach burners made in America, and it was not worth 2 c. They were making at that time 20-candle mixed coal and water gas; and they could not get from the incandescent burner more than about 5½ candles per cubic foot, while they could get in the ordinary flat-flame burner 4 candles. The conditions might now be such that enrichment did not pay; but when it was adopted in America, it was absolutely necessary that it should be resorted to. Captain White charged gas companies with allowing their customers to use flat-flame burners which only gave from 10 to 12 candle power per cubic foot from gas which on the photometer showed 20 to 22 candle power. He thought such companies had all gone into bankruptcy. There was no up-to-date gas company that did not see that its consumers had a burner that would give 20 or 22 candles from 20 to 22 candle gas. It was just as easy for the consumer to get this power as it was to get it on the photometer. The candle power of gas was usually a question that had to be decided entirely by local conditions. Gas men were not selling gas for light only—in fact, they were not selling gas at all; but, as Mr. Glasgow said in his paper before the American Gaslight Association last October, they were selling what gas would give—they were selling energy. What gas companies had to do, in regard to working out what would be the greatest success, was to find out the quality of gas that would furnish the greatest amount of energy at the least cost. A 50 c. gas, with only 300 heat units, was not worth so much as $1 gas with 600. Gas companies had to settle for themselves the question of what kind of gas they were going to make in order to give the consumer the most for his money. It might be coal gas in one place, and carburetted water gas of 22 or even 24 candle power in another.

In response to a request by the President, Mr. Forrest E. Barker, the Chairman of the Board of Gas and Electric Light Commissioners of Massachusetts, made a few remarks on the subject of the paper. He said the companies in his State had not been specially ambitious to obtain the very high candle powers to which reference had been made. The legal standard was formerly 15 candles; but for some years it had been 16, and there had been no move for several years in the direction of raising this figure. An average of 22 candles would be very exceptional. He had some doubt whether, taking the country through, the gas generally would reach the Massachusetts standard, though it might be true that the quality supplied gave as general satisfaction. He thought there was a great deal of force in Mr. Forstall's suggestion that the candle power was largely a local question. There was pretty certain to be a conviction in the public mind that if gas was of 20-candle power, the consumers were getting more for their money than if it was 16-candle gas. One could hardly consider this question without being impressed with the importance of increased efforts being made by gas companies to assist their customers, as far as practicable, in securing the best results from their gas. He thought there was a growing tendency in the best management to do more work of this character, in order that the consumers might get better value out of the gas. With increased attention, it might be that, even with gas of lower candle power than was now commonly supplied, consumers would be able to realize more for their money.

Mr. Alten S. Miller remarked that, taking gas of 20 to 22 candles, a reduction of 1 candle ordinarily lowered the heating power about 3 per cent. If they were selling the gas at so much per unit, would it not be cheaper to keep these units in than to drop them out, and make a corresponding reduction in the selling price? How many people, he asked, could afford to lower the selling price 9 per cent. in order to reduce the illuminating power of the gas by 3 candles? He thought gas suppliers could afford to raise the illuminating power 3 candles in order to increase the selling price 9 per cent., and give the consumer exactly the same amount for his money.

The President said it seemed to him that the point of the paper was that what the public require is heat, as shown by the fact that from 50 to 70, and sometimes even 80, per cent. of the total output of gas was used for heating purposes. Could they not substitute 14-candle gas, and do just as well practically with but few flat-flame burners, and sending out 60 or 80 per cent. of their gas for fuel, as they were now doing by sending out 18 or 20 candle gas? People on the other side of the Atlantic had not been educated up to 20, 25, and 30 candle power gas, as they had in America; and yet good business was being done. If commercial requirements in America could be satisfied with a good gas of clean, medium candle power and high heating value, which 12 to 14 candle gas would give, there would be some difficulty in selling the product, on account of the ordinances which had been carried into effect the last twenty or thirty years, as the result, in his opinion, of the existence of cheap petroleum. But if people on the other side of the globe could do more business among millions of the population with gas of 12 to 15 candle power than they in America could do, he did not see why they should not gradually work to that condition.

Mr. Forstall remarked that, in the countries referred to by the President, gas suppliers were sending out 12 to 14 candle gas because they could not make it of higher power cheaply. In America they could do so; and there was no reason in the world why it might not pay them to make high-candle gas, even though it did not pay Germany or England to do it. As to the question of being tied up by ordinances, the first problem to be solved was whether it was worth while to take the trouble to educate the public down to gas of lower candle power. If there was no object in having that power, where was the sense of educating the public to it? They had to settle whether low-candle was cheaper than high-candle power for what they ought to give the public before it was worth while to discuss the question whether the public ought to be educated down to low candle power. As to reducing the quality of the gas in heat units or candle power, and giving the consumer the benefit in some other shape than price, he did not think that it would work. Even in the incandescent burner, in spite of what some of their English friends said, the preponderance of evidence seemed to be that the higher the calorific power of the gas, the more light they would get, if they took the trouble to adjust the burner to the gas; and any man not able to do this ought not to be in the gas business.

In replying upon the discussion, Captain White said he thought Mr. Forstall had made a slight mistake as to his (the speaker's) views on the subject of high candle power. He did not believe it to be necessary to cram 25-candle gas down the throats of the consumers when 16-candle power gas would do all they required, and cost a great deal less money. He was glad to hear his friend Mr. Miller, who told them in 1904 the old story which he (Captain White) began to give them in 1876, when he proposed some of the earlier changes in apparatus now so common in America. It was really amusing to have a man always beginning at the wrong end to see whether he could put in a new purchase which would save 50 per cent. in the cost of manufacture. It was the argument usually put forward by the directorate, when a manager undertook to convince them that a change of apparatus would enable them to pay additional dividends, probably make a reduction in price, and certainly enable them to produce better gas. However, it was with much satisfaction he noticed that some of his auditory had come to think as he did. He did not pretend to give them a scientific paper, but only some everyday talk; and he appreciated the kindly spirit in which it had been received.

FRACTIONAL COMBUSTION OF GASEOUS MIXTURES BY MEANS OF PALLADIUM.

By Dr. F. Richardt.

The following is an abstract translation, from the "Journal für Gasbeleuchtung," of an investigation described in a graduation thesis presented to the Technische Hochschule at Karlsruhe by Dr. F. Richardt, the primary object of which was to study the effect of temperature upon the oxidizing action of palladium on different combustible gases.

The substances which are most active in determining a combination between certain gases and the oxygen of the air, are metals of the platinum group; and they are more powerful when employed in a finely-divided state. When, however, they are used in this condition, as soon as the action begins, the temperature varies from particle to particle in an uncontrollable fashion; and therefore all the experiments were carried out with the aid of massive wires, the good heat-conducting powers of which enabled the temperature of reaction to be maintained reasonably uniform. Moreover, in order to prevent the wires from being superheated by the heat of the reaction, the gases examined were diluted till they only contained from 3 to 5 per cent. of combustible matter. The metal actually used was palladium.

Apparatus.

The apparatus employed consisted of a reservoir filled with a mixture of air and the gas under investigation, from which it was forced through an empty washing flask to catch any liquid accidentally carried forward into the coil containing the palladium wire. The coil was prepared by taking a piece of wire 100 centimetres long and 0·4 millimetre in diameter, folding it upon itself till it was only 50 centimetres long, introducing it into a 3 millimetre glass tube, and bending the whole into a spiral. After passing through the coil, the gas entered an absorbing apparatus composed of an Erlenmeyer flask and a Meyer 10-bulb tube, which was charged with a known quantity of standardized baryta water about centinormal in strength. Next, the gas was passed through a Drehschmidt platinum capillary to ensure the combustion of all the methane, and then through a second absorbing device to hold the carbon dioxide. At the end of the operation, the baryta water was titrated with centinormal oxalic acid—phenolphthalein being used as the indicator; and precautions

were taken to prevent the carbon dioxide of the atmosphere from interfering with the accuracy of the results, by rinsing the apparatus out with pure air, by working always in closed vessels, by putting a tube of soda-lime on the inlet of the stock bottle holding the baryta water, and by standardizing the latter afresh before each analysis. In this manner, by knowing the composition of the original gas, and by ascertaining the amount of carbon dioxide produced in the platinum tube, it was easy to calculate the amount of methane oxidized by the palladium. Gravimetric methods of determining the carbon dioxide were rejected, on the ground of their greater complexity and inferior accuracy when such small quantities had to be estimated. When it was desired to determine the hydrogen in the form of water, the gases were dried over calcium chloride and phosphorus pentoxide before entering the palladium tube, and similar weighed tubes were used after it to retain the moisture. But when a simple qualitative test for the presence of moisture was required, the gas was passed over potassium ferrocyanide and iron-ammonium-alum, dried and powdered separately and then mixed together. According to Haber, this indicator becomes blue if 50 cc. of air saturated with water vapour at 20° C. are led over it—*i.e.*, it shows the presence of 0·84 milligramme of water.

In the early part of the research, the reaction coil was kept at the desired temperature by plunging it into a bath filled with a suitable fluid—viz., a water-bath for temperatures up to 100°, an oil-bath up to 300°, a bath of potassium-sodium nitrate up to 500°, a bath of sulphur for the precise temperature of 450°, and one of phosphorus pentasulphide for that of 505° C. When higher temperatures were required, the coil was inserted into a thermostat consisting of a pair of crucibles placed one inside the other, the intermediate space being filled with lead. The Le Chatelier thermo-couple used to observe the temperature and the coil were slung in the interior of the inner crucible, while the mouths of both were tightly sealed with asbestos. The whole apparatus was supported inside a fire-clay cylinder. Up to a temperature of 600° or thereabouts, variations of 5° or 10° seldom occurred, even when no governor was employed on the pipe supplying the gas needed to heat the thermostat; but at higher heats, the varying calorific power of the gas supply prevented the temperature from being kept constant, even when a governor was added to the service. Later in the research, an electric tube furnace, constructed by Heraeus, of Hanau, was employed to heat the palladium coil; the thermo-element lying in a separate tube. Preliminary experiments, made by moving the thermo-couple to different parts of the furnace, showed that the temperature was constant over the whole of the portion occupied by the palladium coil.

The Oxidation Temperatures of Hydrogen and Carbon Monoxide.

Hydrogen and carbon monoxide are known to be distinguished from other combustible gases by reason of the low temperatures at which they are oxidized in the presence of catalyzers. Haber has already carried out much work in this direction; but he limited himself to a study of gaseous mixtures containing not more than 1 or 2 per cent. of these bodies—*i.e.*, to an examination of such gases as compose the exhaust of explosion engines. The object of the present author was to see if his results applied equally to richer materials, such as unburnt coal gas and water gas. The hydrogen employed was prepared by the electrolysis of dilute sulphuric acid, and from it a mixture containing 4 per cent. by volume of hydrogen and 96 per cent. of air was made up. When this mixture was led through the palladium coil in a perfectly dry state,* Haber's moisture indicator showed that oxidation began between 50° and 60° C. At 150°, 81 per cent. of the hydrogen was oxidized; at 200° C combustion was complete.

The carbon monoxide was prepared from potassium ferrocyanide and strong sulphuric acid, and freed from traces of cyanogen by washing it with an emulsion of ferrous and potassium hydroxides. Mixtures were made up containing 4 per cent. of it, with 96 per cent. of air, as in the case of hydrogen; but some of the mixtures were dry, and others saturated with moisture. They were led through the glass coil at such speed that each particle of gas remained in contact with the palladium for 7 or 8 seconds. The results of the analyses showed that carbon monoxide just begins to be oxidized in contact with palladium at a temperature of 180° C., and that the process is complete at a little over 300° C.—in fact, the temperature of oxidation is exactly 100° above that of hydrogen. The curious phenomenon that it is difficult or impossible to ignite carbon monoxide either by flame or by explosion when the gas is perfectly dry, even at elevated temperatures, is not repeated in the presence of palladium; and therefore the critical figures quoted above apply equally to the dry and to the moist gas. From some recent experiments of Wöhler's on platinum, it would seem possible that an oxidized derivative of palladium acts as a carrier of the atmospheric oxygen, so that the water vapour which is required to initiate oxidation in the usual way plays no part in the operation when palladium is at hand. Provided the gas was not led so rapidly through the coil that the wire became locally raised in temperature by the heat of the reaction, an alteration in speed of the current made no difference in the amount of carbon monoxide consumed.

* It was obviously necessary to dry this mixture before testing it, because the commencement of oxidation could only be detected by the appearance of water vapour.

Experiments were next carried out in order to ascertain to what extent the oxidation temperature of carbon monoxide was affected by the presence of hydrogen, and *vice versa*. The gaseous mixtures tested contained (*a*) 3 parts by volume of carbon monoxide to 1 of hydrogen, or about 8 per cent. of combustible matter in all, and (*b*) equal parts of either gas, or nearly 11 per cent. of combustible matter. They were examined in the dry state. It was found that whereas hydrogen alone was completely oxidized at a temperature of 200° C., the presence of carbon monoxide caused 63 or 92 per cent. of it to remain unattacked; and, conversely, that at temperatures at which carbon monoxide alone was unaffected by the palladium wire, the presence of hydrogen caused noteworthy quantities of it to suffer oxidation. The results of the inquiry, therefore, bore out Haber's statement that carbon monoxide and hydrogen cannot be separated one from another by fractional oxidation either in rich or in poor gaseous mixtures.

The Oxidation Temperature of Methane.

The methane required was prepared from methyl iodide by the Gladstone and Tribe method—*i.e.*, with the aid of a zinc-copper couple. It was purified by being left in contact with fuming sulphuric acid for some hours, and then freed from hydrogen by being led over anhydrous palladious chloride at a temperature of 50° C. When the methane had been evolved at a sufficiently slow rate, the gas was found to have a purity of 99 per cent. Various mixtures of the methane with air containing from 3 to 12 per cent. of the hydrocarbon were led through the palladium tube at different temperatures, and at speeds which allowed the gas to remain in contact with the wire for periods of from 2·5 to 7·5 seconds. An appreciable amount of oxidation did not set in till a temperature of 600° C. was reached; this figure being 150° higher than that noted by Haber when he used palladiumized asbestos. The proportion of methane present in the gaseous mixture made no difference to the results. Mixtures of methane and hydrogen, containing the two gases in the proportion of 4:6 (which is the usual ratio in the case of coal gas), were next tried; and it was found that the presence of the hydrogen did not affect the oxidation-temperature of the methane. Thus it would appear that, in the determination of hydrogen by fractional oxidation, the temperature must not exceed 550° or 600°C. if a combustion of the methane in notable quantity is to be avoided.

The Velocity of Oxidation of Methane.

As is well known, Mallard and Le Chatelier have shown that while explosive mixtures of air and hydrogen or carbon monoxide ignite immediately they are brought to the proper temperature, similar mixtures composed of methane as the solitary explosive constituent do not fire till they have stood at the critical temperature for some time. At temperatures between 600° and 700°C., ignition is delayed for a period of some 10 seconds; but at higher temperatures the retardation is less, until, at 1000°, it is no longer noticeable. This delay cannot be explained on the assumption that it represents the time occupied by the gaseous mixture in attaining the temperature in question, because, owing to the small specific heats of the gases, such time would be only a fraction of a second, and, moreover, there is no such delay when carbon monoxide or hydrogen is examined. Mallard and Le Chatelier offer for this phenomenon an explanation similar to that given by Dixon in the analogous case of mixtures of air with dry carbon monoxide. They suggest that in explosive mixtures containing it, methane requires the presence of water vapour to start its oxidation; the action proceeding as follows:—

$$CH_4 + 2H_2O = CO_2 + 4H_2.$$

The hydrogen thus liberated combines with the excess of oxygen in the gaseous mixture to form water again. Hence the oxidation of the methane only proceeds slowly when but little moisture is at hand; but it increases in rapidity directly the quantity of moisture present is sufficient. It therefore became desirable to ascertain whether a similar retardation occurred in the non-explosive mixtures of methane and air which were passed over the palladium wire.

With this object in view, a new spiral was prepared, smaller in cubical contents than that previously employed, so that the speed of the gaseous mixture might be considerably increased. A fresh wire was taken, 6·5 centimetres long, by 0·4 millimetre in diameter; it was bent upon itself 3·5 times and introduced into a glass tube 1·5 millimetres in internal diameter. In this new coil, each particle of gas only remained in contact with the wire for a period of from 0·004 to 0·007 second; whereas in the old coil the time of contact ranged from 2·6 to 7·5 seconds. The length of the furnace, however, was such that, even when working at the higher speed, the gaseous mixtures were exposed to the temperature of operation for a period of 0·06 second before reaching the palladium wire; so that they were given ample time to reach the temperature of the spiral. The first mixtures tested were composed of methane only, and contained 3 per cent. of that gas with 97 per cent. of air. When passed over the wire at the lower speed, about 1·3 per cent. of the methane present was oxidized at the temperature of 600°C.; but when led through the spiral at the higher speed, the same quantity of methane was not attacked till the temperature was increased to 800° C. The second mixtures contained 3·2 per cent. of methane and 5·5 per cent. of hydrogen; and it was found in all cases that up to a

certain temperature the oxidation of the methane proceeded slowly, but that as soon as that temperature was exceeded, the velocity of the action increased rapidly with every rise in the temperature.

Expressed graphically, all the curves showing the oxidation of the methane exhibit distinct alterations of form at a certain temperature; but, unfortunately, the critical temperature cannot be recorded in figures, since small irregularities in the conditions of each experiment (which are hardly to be avoided) affect it seriously. When led over the coil at a low speed, the rapid oxidation of the methane begins between 500° and 600° C.; but at a high speed the similar temperature is between 750° and 800° C. In fact, at the lower speed, the curves representing the oxidation of the methane in methane-air mixtures and in methane-hydrogen-air mixtures are sensibly the same, for the hydrogen does not accelerate the velocity of oxidation. At the higher speed of travel over the coil, however, conditions are different. Up to a temperature of 650°, the speed of oxidation of the methane is essentially the same whether hydrogen is present or no; but above this temperature the usual retardation of the velocity of explosion is apparently quite overcome by the action of the hydrogen. The reason for this is not difficult to see. When the gaseous mixture is led rapidly over the palladium coil at a high temperature—*e.g.*, above 650° C.—the hydrogen is oxidized so quickly, and the wire is heated to such a temperature, that the retardation is first diminished and eventually disappears. In fact, the thermo-couple, which lies in the furnace within its own tube, does not give the temperature of the palladium wire accurately at temperatures exceeding 700° C. Even when the gaseous mixture is led over the coil at the higher rate of speed, the hydrogen in the methane-hydrogen-air mixture is completely oxidized. Residual hydrogen was sought for by passing some of the gas issuing from the coil into a vessel charged with palladium chloride at a temperature of 50°. Had hydrogen been present, hydrochloric acid would have been produced, and this would have given the usual test with silver nitrate; but the reaction failed. Absence of hydrogen was also demonstrated by analyzing the gas over mercury.

Analysis of Gaseous Mixtures by Fractional Combustion.

The foregoing research contains much useful information as to the conditions which should be maintained in the analysis of gaseous mixtures by means of palladium wire. Methods in which palladiumized asbestos are used should be rejected, for the temperature of the catalyzer is not under proper control, and it may easily rise too high. When massive palladium wire is employed, as first proposed by Bunte, it should not be allowed to reach the red heat mentioned in the books. A temperature which is visible by daylight as faint redness corresponds with 750° or 800° C., as may be seen by inspecting the junction of a Le Chatelier thermo-couple. At such a temperature, between 0·4 and 3 per cent. of the methane present in a gaseous mixture may be oxidized by the palladium wire. When hard combustion tubing is exposed to a bunsen flame, the flame just begins to show the presence of potassium or sodium compounds in it at a temperature of 550° to 600° C. This is the temperature at which the hydrogen should be oxidized; and if the gaseous mixture is led over the wire at a high speed, the hydrogen will be entirely eliminated, and the methane be left untouched. Only one passage over the wire is necessary; but if a second is preferred, the temperature may be urged a little, because, in the absence of the hydrogen, the low oxidation-velocity of the methane will protect it. To exemplify the accuracy of the process, Richardt quotes the analytical data obtained on treating a gas of artificial constitution which contained 40·1 per cent. of methane, 55·3 per cent. of hydrogen, and 4·6 per cent. of nitrogen. This was mixed with nearly four times its volume of air, and passed over the palladium wire. In three tests the hydrogen found was 54·8, 55·2, and 55·15 per cent.

Behaviour of Ethane and Ethylene.

The ethane tested was prepared from ethyl iodide and purified in the manner already described for methane. It was made up into a gaseous mixture containing 3 per cent. of hydrocarbon, and was passed over the coil at the lower speed. It was found that the temperature of oxidation was roughly identical with that of methane. At temperatures below 650° C., methane was oxidized the more freely; at temperatures above 650° C., ethane was the more readily decomposed. When passed over the palladium at the high speed, the curves representing the oxidation of ethane and that of methane were practically identical up to a temperature of 700° C.; but above this temperature the ethane curve rose more rapidly. Evidently, the retardation which Mallard and Le Chatelier only noticed in the case of methane applies to ethane as well, though in a less marked degree; and if it were safe to speculate from the behaviour of these two hydrocarbons, it might be said that the retarding effect would become the less conspicuous as the molecules of an homologous series of compounds increased in size. At the lower speed of passage, hydrogen exerted no influence upon the oxidation temperature of the ethane; at the higher rate, it overcame the retardation, as in the case of methane, and the same difficulty of gauging or controlling the temperature of the palladium cropped up. The ethylene was prepared from alcohol by heating it with strong sulphuric acid; the gas being purified by long continued treatment with strong sulphuric acid and potassium hydroxide. It was stored over a saturated solution of common salt, and was tested in the form of a 2 per cent. mixture with air. The ethylene began to oxidize at a temperature of 300° C.

General Conclusions.

From what has been said, it will be seen that, as Haber has already stated, palladium wire exerts no catalytic action upon methane at temperatures below 450° C. At temperatures above 450° C., and below those of a red heat, sensible quantities of methane are oxidized, provided the gases remain in contact with the wire for a sufficient length of time. If a mixture of methane and air passes over the wire quickly, no appreciable amount of methane will be burnt at temperatures of 600° or 650° C. At both temperatures, and at both rates of motion, the hydrogen is oxidized quantitatively. If the gaseous mixture is led over the wire cautiously and slowly, the combustion of methane is not affected by the presence of hydrogen; but at a high rate of passage, the heat evolved by the oxidation of the hydrogen causes the natural retardation of the oxidation velocity of the methane to disappear. Broadly speaking, ethane behaves like methane, but the phenomenon of retardation is not so pronounced. A separation of ethane from methane by the method of fractional oxidation is impossible; but a separation of either ethane or methane from hydrogen can be easily effected according to the rules laid down above. A separation of ethylene from a mixture containing it, air, and either methane or ethane is also impossible; and so is a separation of hydrogen from a mixture of ethylene and hydrogen. The best and simplest method of removing ethylene from a gaseous mixture is by absorption in bromine water.

THE JÄGER SYSTEM OF PURIFICATION AT THE AMSTERDAM GAS-WORKS.

Writing in a recent issue of "Het Gas," Mr. Rossum du Chattell claims that their experience in the use of Jäger grids at the Amsterdam Gas-Works cannot be called otherwise than very successful. He says: The house in which the purifiers are placed is divided into two sections of eight boxes each, A and B. Set A contained the box fitted on the Jäger system. During a period of 71 days—*i.e.*, from Nov. 8, 1903, until Jan. 17, 1904—the main gas inlet to set A was entirely open, while that of set B was open about one-tenth; and it can be assumed that the greatest part of the make of gas during the period named (amounting to 277,660,000 cubic feet) passed through set A. During the whole of this period, set A only had a box changed twice, owing to excessive pressure; while in set B, eight boxes had to be changed, owing to the same cause. When emptying the boxes, if the grids are taken up, the oxide falls out by a little shaking. The use of picks to loosen the oxide is quite unnecessary. Moreover, it is easily understood that, where the material is divided into so many partitions, it is impossible for it to become hard. The pressure shown on the Jäger fitted box varied between 1-10th and 3-10ths of an inch. In conclusion, Mr. Rossum du Chattell says: "Our experience with the Jäger system has led us to adapt the system to five more purifiers, and we hope thereby to delay enlarging our purifier house for a long time to come."

Among the large number of Members of Parliament who have signified their intention not to seek re-election when the present Government go out of office, we regret to notice the name of Sir John Aird Bart., the representative of North Paddington.

We are pleased to see that the Smethwick Town Council have acknowledged the valuable services rendered by their Gas Engineer and Manager (Mr. Vincent Hughes) and Secretary (Mr. W. J. Sturges) by raising their respective salaries by £50 per annum. There was a long discussion on the matter, and some little opposition was shown to the Secretary's increase, though it should be pointed out that there was no lack of appreciation of the work of either gentleman. No attempt was made to depreciate the worth of Mr. Sturges (who was appointed to his present position 23 years ago); the contention being merely that the proposed figure was more than the town could afford to pay. There was really no opposition in the case of Mr. Hughes, to whose ability high tribute was paid by several members of the Council.

We have received from the Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus) the names of prize winners in the last examinations in "Gas Manufacture," a list of the successful candidates in which was given in the "Journal" for the 14th ult. (p. 789). The winner of the first prize in the Honours Grade (£2 and the Institute's silver medal) is Mr. Percy Ward; the second prize (£2 and the Institute's bronze medal) being taken by Mr. Harold Higham. In the Ordinary Grade, the first prize (£1 and the Institute's silver medal) was won by Mr. W. Newton Booth; the second (£1 and a bronze medal), by Mr. J. M'Nicholl; and the third (a bronze medal), by Mr. Frank Saville. The money prizes are given by the Salters' Company. Mr. Ward, who stands first in the Honours list, studied at the University College, Sheffield, and Mr. Higham at the Municipal School of Technology, Manchester. The prize winners in the Ordinary Grade came from the Municipal Technical School, Halifax; the Rutherford College, Newcastle-on-Tyne; and the Technical School, Dewsbury.

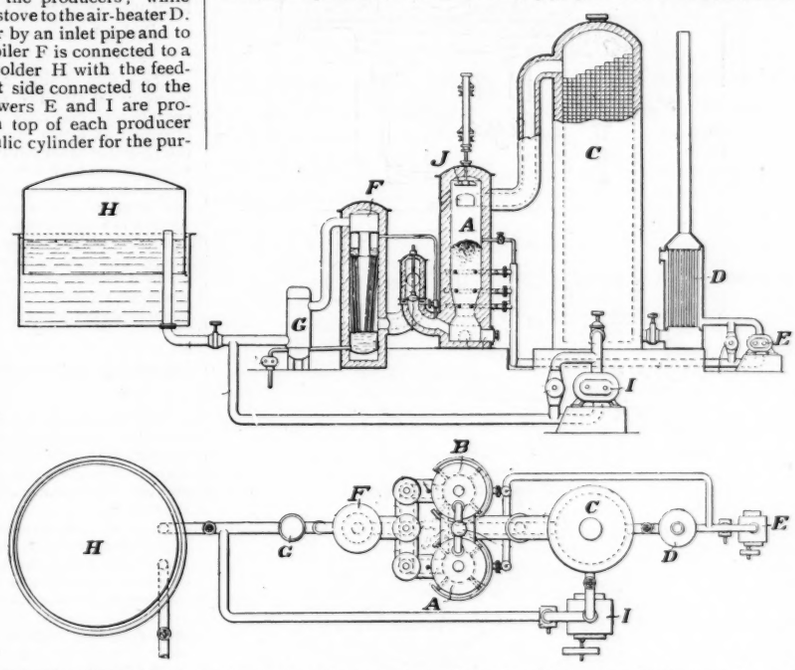
REGISTER OF PATENTS.

Manufacture of Gas.—Westinghouse, G.; a communication from A. M. Gow, of Allegheny, Penn., U.S.A. No. 17,215; Aug. 7, 1903.

In his specification, the patentee uses the term "producer gas" to designate gas made by the incomplete combustion of carbon with the oxygen of the air, with or without the presence of steam; the term "water gas" to designate gas made by the decomposition of steam in the presence of incandescent carbon; and "distilled gas" to designate the gas resulting from the distillation of the volatile portion of the carbonaceous material. In the making of water gas, it is evident, he says, that the particles cannot become incandescent until the volatile matter in the substance has been driven off. For instance, a particle of coke containing moisture could not become incandescent until the moisture had been expelled. Bituminous coal contains a large percentage of volatile matter of high calorific value. To make water gas from such material, therefore, two operations must be performed. The coal must be reduced to coke by driving off the volatile matter by the application of heat; and then the coke must be converted into water gas by the application of heat in the presence of steam.

Each of these three types of gas has its own characteristics, which render it peculiarly well adapted to certain uses; and the purpose of the present invention is to provide apparatus which shall have such a wide range of operation that the three gases can be made in determinable quantities and mixed together in such proportions as may be best adapted for the special purpose for which the gas is desired.

A and B are two gas-producers constructed in the usual manner, connected near their tops by a passage-way or pipe. C is a stove or chamber filled with refractory material—preferably fire-brick—for the storage of heat. It is connected by pipes to the producers; while another pipe, provided with a valve, connects the stove to the air-heater D. A blower or fan E is connected to the air-heater by an inlet pipe and to the producers by a discharge pipe. A steam-boiler F is connected to a feed-water heater G, and pipes connect a gasholder H with the feed-water heater. A blower or fan I has its inlet side connected to the holder and its outlet to the stove C. The blowers E and I are provided with a bye-pass or "churn" valve. On top of each producer is a rammer or chopper J, operated by a hydraulic cylinder for the purpose of agitating the fuel bed.



To start up from a cold apparatus, the operation is as follows: A wood fire is put into the producers, and they are then charged with coke to a convenient depth. The blower E is started, and air is blown into the producers; the resulting producer gas being consumed in the producer above the fuel bed by the admission of air. The resulting products of combustion pass into the stove C, where their sensible heat is absorbed by the fire-brick. They pass downward through the stove into the atmosphere. Air at the same time is being drawn by the blower E through the air-heater, picking up heat from the waste gases not absorbed by the stove. This blasting-up operation is continued until the coke is blown to incandescence and a large amount of heat stored in the stove. The blower is now stopped, and the set of valves reversed, and the blower I is started. The system is now full of air and products of combustion. The blower I serves to cause a circulation of the gases in the system; and circulation proceeds from the blower through the stove C, where the circulating gases become intensely heated. They pass down into the producer B, downward through the hot fuel bed, and through the steam-boiler F, where they raise steam. As soon as this occurs, it is permitted to escape into the producer A, which contains incandescent coke. Water gas is immediately made. It passes up through the fuel bed in the producer A, and joins the strand of gas that the blower is circulating. Ground coal of suitable fineness is now fed into the producer B. It falls into the intensely hot strand coming from the stove; and the result is that each particle of coal is almost instantly converted into coke. The volatile gases resulting from this coking action augment the volume of the circulating gases and pass downward through the fuel bed of the producer B. In the fuel bed the heavy hydrocarbons are broken into lower forms—that is to say, the tar and vapours are converted into hydrogen and free carbon. A certain percentage of CH_4 will also be broken up into carbon and hydrogen; the amount so broken up depending upon the temperature and depth of the fuel bed. The resulting gas passing out at the bottom of the producer B will, therefore, be a mixed gas containing all the volatile matter of the coal, the water gas produced by the steam in the producer A, and the circulating strand. As the volume of gas in the system increases, the holder rises; and when the temperature of the producer A is reduced below the point for the economical making of water gas, the steam is shut off and the operations reversed. Producer B is still hot from the blasting up, inasmuch as the heat for the distillation of coal was supplied from the stove. Steam is now turned into the producer B, and coal is fed into the producer A and distilled therein by heat brought from the stove by the strand. When the gas-making operations have been carried on for such a length of time that the temperature of both producers is reduced below the point of economical working, the steam is shut off, the blower I stopped, coal feeding is stopped, and the valves are closed. The stove is now full of gas, which it is desirable to save. The bye-pass valve on the blower I is opened, and the fan E started. Producer gas thus made pushes the water gas ahead of it; and when, in the judgment of the operator, the stove has been practically freed of its content of water gas, the valves are again reversed, the two producers are blown to incandescence, and the stove reheated as before.

The above method of procedure constitutes the operations involved in the manufacture of a gas which is a mixture of water gas and distilled gas, and is, with the exception of the small percentage of carbonic acid, all combustible. For certain purposes it might be desirable to obtain from a given weight of coal a larger volume of gas of lower calorific value. In such case, simultaneously with the injection of steam into the incandescent fuel bed, air from the blower E is admitted to the producer. The resulting gas would be a mixture of producer gas, water gas, and distilled gas. Its calorific power would be reduced by the nitrogen present—incident to the manufacture of producer gas; and the quantity of nitrogen present would be relative to the amount of producer gas made.

From the foregoing, it will be seen that the apparatus constitutes a means whereby soft coal may be converted into gas of any desired calorific value—from producer gas to water gas—and at the same time the volatile matter of the coal is converted into fixed gas and added to the volume of other gases made.

It has been found in practice that, when using fine bituminous coal, the character of the fuel bed will be determined by the amount of coking to which the particles of coal are subjected—that is to say, if the amount of heat carried from the stove into the producer be very large relative to the quantity of coal fed, the particles of coal will be completely coked, and the resulting fuel bed will be composed of fine granular and free flocculent carbon. If the feed of coal be increased, the strand remaining the same, the coking operation will not be so complete; and the particles of coke will adhere to each other—forming lumps of light, porous, spongy coke. It lies within the power of the operator, therefore, to control the character of the fuel bed.

The volume of gas carrying the heat necessary for the distillation of a given weight of fuel charged will depend on the amount of the volatile matter contained. For instance, to drive off in the same unit of time the gases from a coal containing 50 per cent. of volatile matter will require a larger volume of gas than is necessary in the case of a coal containing but 25 per cent. of volatile matter. If, therefore, the heat carried to the boiler in the second case were just sufficient to raise the amount of steam needed for the operation of the plant, there would be an excess of steam in the first case.

Among some of the "advantageous features" of the invention may be mentioned the following: The gasholder forms a part of the system; therefore, the entire system is at all times under holder pressure, so that there is no liability of a vacuum or a leakage of air in any portion into the apparatus. No valve is required to separate the gas made from the circulating gas. The stove is used for conserving the waste heat passing out from the producer at the time of blowing up, and is not used to store heat for the water gas reaction but only the heat necessary for the distillation of fresh charges of coal and raising steam. It, therefore, need not be as large as would be required in case it was used for storage of heat for a long water-gas run. Inasmuch as the blower takes gas from the holder, the cold end of the stove is not liable to become hot. The volume of gas passing from the producer to the stove to heat the stove is less than the volume passing in the reverse direction. Therefore, the convection of heat from the cold end to the hot end of the stove is greater than from the hot to the cold end. Inasmuch as no oxygen passes down through the fire bed, there can be no ash formed on top of the fire; but the ash and clinker will be at the bottom of the producer, and may be removed in the usual manner. Water gas is made in a producer in which there can be maintained an atmosphere of steam, so that the interstices in the incandescent fuel bed will be completely filled with steam, and the consequent comparatively slow velocity of the steam through the fuel bed will permit the time-element to enter as a factor in the decomposition. The heat of convection of the water gas assists in the distillation of the coal; the gas coming off from the producer at a high temperature, mixed with the strand of gas coming from the stove, augmenting the volume and the heat carried. The steam necessary for the water-gas reaction and for operating the plant is raised in a steam-boiler; the heat being

supplied by the circulating strand of gas. In quantity, it is entirely under the control of the operator.

Controlling Gas-Engines.—Bradley, H. W., and Bickerton, H. N., of Ashton-under-Lyne, and Dugald Clerk, of Ewhurst, Surrey. No. 14,012; June 23, 1903.

The gas-engines referred to are those operating with suction gas-producers; and the objects aimed at are: (1) To so control or govern the engine that, notwithstanding great and rapid variations of load, the producer is always kept in a sufficiently active state at light loads as to immediately respond to the increased consumption of gas required at heavy loads; (2) to provide an attachment to gas-engine governors which permits the governor to be arranged for either rapidly or slowly varying the loads.

In suction gas-producers at present in use, the patentees point out that the movement of the gas-engine piston draws gas from a suction gas-producer and air from the atmosphere. When the engine is working at full load, the whole mass of fuel in the producer is incandescent. If an engine, however, works for a considerable period of time at a light load, then a smaller mass of fuel in the producer becomes incandescent, and any sudden increase in the air drawn through the producer to meet an increase of load results in deteriorating the gas supply.

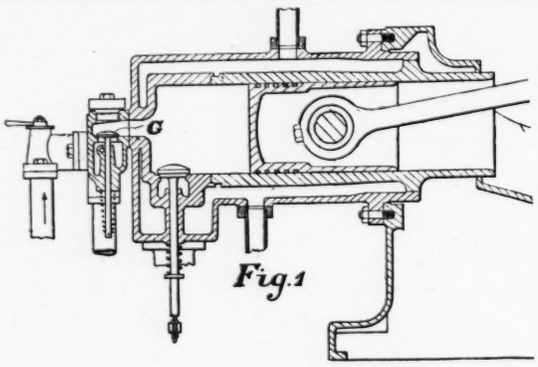


Fig. 1.

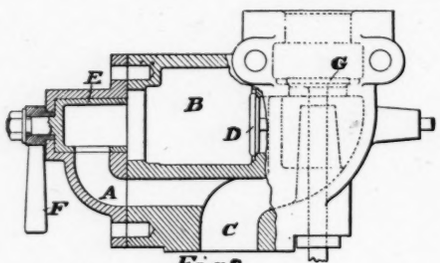


Fig. 2.

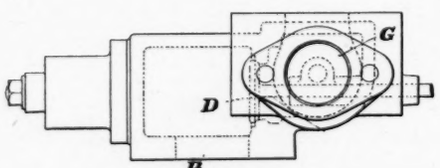


Fig. 3.

Where great variations of load occur, it is necessary, therefore, to draw a certain minimum quantity of air through the producer; and the present invention consists broadly in causing the engine to always draw gas from the producer at at least a minimum rate; this rate being such as will maintain a sufficient incandescent zone in the producer ready to meet sudden increases of load. It also consists in a governor applied to a suction-producer gas-engine, which cuts off the gas supply to the engine to the lowest point which can be safely done without allowing the producer to cool; and when this point is reached, governs the engine, not by any further reduction of the supply of gas, but by operating on the igniting device to prevent ignition taking place. The engine thus continues to draw through the producer the minimum amount of air required to keep it in a condition to become fully active instantly when required.

Fig. 1 is a sectional elevation of a gas-engine illustrating the application of the invention according to one modification whereby a minimum quantity of gas sufficient to maintain adequate incandescence in the producer is drawn through a bye-pass when the gas-valve is closed by the governor. Figs. 2 and 3 are an end part sectional elevation and a plan illustrating this modification in detail.

In the air and gas valve casing there is a bye-pass A leading from the gas-passage B into the air-suction passage C, so that when the gas-valve D does not open, the engine still draws a certain quantity of gas through A sufficient to maintain adequate incandescence in the producer, so as to enable the latter to instantly respond to a sudden increase of load on the engine. In the bye-pass A a cock E is provided, fitted with a handle F, by which it can be set. The latter may (if desired) be connected to the main gas-tap, so that when it is shut, the bye-pass is also closed. The air-valve is shown at G.

Separating the Phenols of Coal Tar from the Neutral Constituents.—Schulze, E., and the Chemische Fabrik Ladenberg, Germany. No. 17,266; Aug. 8, 1903.

The patentees propose that to from 200 to 210 kilos. of tar oil containing phenol, or rather crude carbolic acid, there should be added 56 kilos. of milk of lime containing about 10 per cent. of CaO. It is then filtered, allowed to settle, and the calcium salt solution of the phenols drawn off. The crude lye thus obtained is boiled in a vacuum apparatus avoiding any heating beyond 60 to 65° C., so long as the tar oils still mixed therewith are distilled off. The then pure lye is either drawn off in order to be decomposed in the ordinary manner with mineral acids, or the distillation is continued, preferably with the assistance of steam under ordinary conditions of pressure, whereby the half of the phenols contained in the lye is distilled over.

When the distillation is so far completed, the phenols driven off are separated from the water of distillation in a suitable manner, and the latter is utilized, together with the residual basic calcium phenolates, for dissolving fresh quantities of phenols; but it must be noted that for the formation of neutral salts two molecules of phenol require only one molecule of CaO, but two molecules of basic calcium phenolate.

What they claim as their invention is: In a process for the separation of the phenols of coal tar from the neutral oils by means of lime, producing the neutral lime salts of the phenols by the action of lime or basic calcium phenolate on the phenols in the presence of water at temperatures below 70° C.; the lyes obtained being preferably freed by distillation *in vacuo* at a temperature (about 60° C.) from the dissolved neutral oils and the like, and then split up, by further distillation at 100° C., or, under normal pressure, into phenol and basic calcium phenolate, or decomposed in the ordinary way by mineral acids.

Internal Combustion Engines with Reciprocating Cylinders and Fixed Pistons.—Prestwich, P., of Monton, Lancs. No. 18,778; Sept. 1, 1903.

The object of this invention is, in the first part, to provide means whereby an impulse may be obtained at every revolution of a gas-engine, and, secondly, to provide means whereby an impulse may be obtained at every stroke. For these purposes, under the first part the patentee arranges two pistons with their ends exactly opposite each other, over which is fitted (free to slide) a reciprocating cylinder having in the centre a dividing wall or partition which receives and transmits the force of the explosion. Under the second part, two pairs of pistons are employed, with their ends arranged opposite each other and fitted with cylinders as in the first part. The manner of arranging the pistons may be in any of the following: Firstly, by having pistons all in a line with each other; secondly, each pair of pistons may be arranged parallel to the other pair; and, thirdly, one pair may be situated directly over the other pair.

Solidifying Tar.—Coulson, S. G., of Sheffield. No. 2102; June 28, 1904.

This invention, relating to the treatment of gas or coal tar, has for its object to render such tar sufficiently solid for safe transport and to permit of its being granulated and mixed with other ingredients in the manufacture of artificial fuel, as a cement, as a waterproofer, and also in road material, with or without pitch and the like natural substances.

With an average quality of materials, the process is as follows: Any required quantity of liquid tar is placed in a boiler or open pan, provided with means for applying heat externally, and being of sufficient depth or capacity to safely allow the tar to expand to more than double its normal volume while under treatment. A low heat—say, 140° to 150° Fahr., or just enough to bring the tar up to boiling point and to reduce its viscosity—is applied; and then to every 100 parts by weight of tar are added gradually, while constantly stirring, from 10 to 12½ parts of concentrated sulphuric acid. The intimate mixture of the acid with the warm tar results in a considerable increase of volume accompanied by a rise of temperature, averaging 80° to 100° Fahr. more or less, according to the quality of the tar and of the acid used in the process. In order to retain as large a proportion as possible of the volatile matters in the finished product, it is preferred to add the acid at intervals, so as to limit the heat arising out of the chemical reaction, in order that the total heat of the compound shall not exceed 250° Fahr. as a maximum.

The process will, as a rule, be completed within half-an-hour from the first addition of acid; but the finished stage may be easily recognized by a recurrence of swelling and thickening of the mixture in the pan accompanied by a fall of temperature.

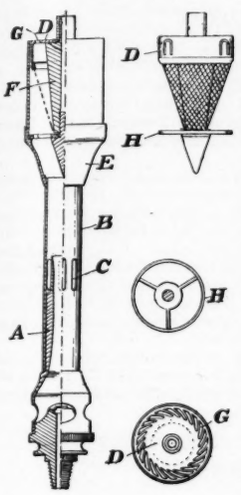
For certain specific uses, the compound may be further improved by the incorporation therewith, while still hot, of particles of solid matter. For example, if the mixture is intended for road-making purposes, the addition of a small proportion of lime or fine sand may be made; or when to be used in the manufacture of artificial fuel or briquettes, a small quantity of combustible matter (such as sawdust, coal dust, or coke dust) may be well stirred in before removal from the pan.

The final stage having been reached, and, if desired, further special treatment also completed, the compound may be ladled out and run into suitable moulds, or be formed into blocks or slabs, which, when cold, may be handled, transported, broken up, re-melted, or granulated.

Incandescent Gas-Burners.—Mallol, J., of Birmingham. No. 11,788; May 24, 1904.

The object of this invention is the production of an incandescent gas-burner which of itself will heat the mixture of gas and air (before arriving at the head of the burner) with the waste heat of the flame after it has done its duty of heating the mantle; that will have sufficient velocity in the gaseous mixture to raise the mantle to a high temperature; and that will be accessible for cleaning.

The nipple through which the gas issues to the nozzle is of ordinary construction; and the nozzle is made with ordinary air inlet holes. The bunsen burner tube A is turned slightly taper inside; and for a short distance down from its upper end the outside is turned away, leaving the top part of smaller diameter and thus forming a space all round this top part when fitted with the outer tube B. In this outer tube, which supports the upper part or mixing-chamber of the burner, there are small apertures C corresponding with the space formed by the smaller part of the tube A; the object of this arrangement being that the gaseous mixture as it ascends through the pipe may induce a further quantity of air through the apertures C to mix with the gaseous mixture as it ascends to the burner-tip—thus "producing a more intimate mixture of gas and air and a higher velocity of same."



The tip of the burner is made of an inverted cup-shaped sheet metal stamping D fitting easily into the ordinary tubular part of the burner, which latter is parallel inside and out, and is screwed on to the usual mouthpiece E fixed to the top of the tube B. This inverted cup-shaped tip has a rim of suitable depth in which are piercings (preferably three in number) forming tongues which spring outwardly sufficiently to grip the interior of the tube, and so prevent the tip part D, and the parts to which it is fixed, from falling out when the burner is inverted. This tip part D is pierced with elongated holes G (as shown), which at their ends nearer to the periphery of the tip are wide, and are narrowed down at their other ends which are nearer to the centre of the burner. These slots G are tangental to a circle of smaller diameter than the outside of the burner, so that the slots overlap each other, as shown at side; and thus the gaseous mixture as it issues through them is formed into a sort of double flame, which will consume sufficient gas to fill the cavity of the mantle and yet bring the total flame as near to the mantle as possible.

The tip F of the burner is fixed to the top of the thick metal core or stem which forms the interior of the removable upper part of the burner, and heats the gaseous mixture to a high temperature before it issues through the slots G. The core or stem is reduced in diameter at the top so as to form a shoulder, on which the tip fits and is secured by a nut screwed on to a central upwardly projecting boss part formed on the top of F. In the core or stem, there is a central hole to receive the usual mantle support. Surrounding the stem is a wire gauze part made of an inverted conical form; the top being finished with a metal ring of the same diameter as the rim of the cup-shaped tip part D. Below this wire gauze is a wheel-shaped part H, the periphery of which is of the same diameter as the tip, so as to rest upon a shoulder formed at a short distance below the top of the mouthpiece E. The lower end of the wire gauze fits between the boss of this wheel part and the bottom of the central core F, and is there secured by a plug screwed into the interior of the stem, and made with a collar or shoulder part which bears against the boss of the wheel-like part, and thus clamps it against the inturned bottom of the gauze and clamps the latter against the bottom of the stem or core. The result of this arrangement is that when the mantle is in position and the burner is alight, the flame heats the cup tip D, and the heat is transmitted from it to the outer tube and to the core and wire gauze and lower plug, so that these parts heat the gaseous mixture before it issues through the openings G, and "produce a more intimate mixture of the gas and air, and thus a high degree of incandescence of the mantle is attained."

APPLICATIONS FOR LETTERS PATENT.

15,448.—M'Lachlan, J. C., "Combined gas and steam engines." July 11.
15,544.—Bailey, A. W., "Incandescent burners." July 12.
15,652.—Hawkyard, J., and Meters, Limited, "Prepayment meters." July 14.
15,667.—Ferrington, G., and Little, A. J., "Generating acetylene." July 14.
15,673.—Serjeant, C., and Lagen, F., "Atmospheric gas lighting." July 14.
15,684.—Wolff, C. E., "Recording and measuring the flow of liquids." July 14.
15,685.—Cornell, O. D., "Gas-burners." July 14.
15,686.—Cohn, S., "Incandescent mantles." July 14.
15,688.—Stone, J., and Co., Limited, and Jakeman, G. E., "Tapping mains." July 14.
15,698.—Nutting, J., "Gas-stoves." July 14.
15,761.—Groll, C., "Generator furnaces." July 15.
15,821.—Mason, W. F., "Manufacturing producer and water gas." July 16.
15,846.—Spencer, J. W., "Regenerative furnaces." July 16.
15,860.—Derval, E., "Retort-benches." July 16.

Consumption of Water in the Manchester District.—Manchester and its surroundings are just now consuming very large quantities of water. The record call upon the reservoirs was reached on the 11th inst., when more than 42 million gallons of water was sent out. On three other days the same week, the call exceeded 40 millions per day. The quantity of water supplied per day during the last nine years has ranged from 27,683,449 gallons (1896) to 32,752,561 gallons (1903).

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

A Gasholder and Preferential Treatment.

Sir,—Readers of the "Journal," whether they are or are not interesting themselves in the fiscal policy question, or are or are not of the same mind as Mr. Joseph Chamberlain, will, I am sure, rejoice that a British manufacturer has succeeded in obtaining the order for the Toronto gasholder in the teeth of foreign competition. This is the more satisfactory since it shows that the preference given to Great Britain by Canada is not quite so disappointing in its results as it appeared to the late Colonial Secretary when he addressed the delegates from that Colony some time ago. This preference is not, however, due to Mr. Chamberlain, nor has it formed a part of his programme. It was the spontaneous expression by the Canadian Government of that goodwill towards the Mother Country which a year ago we were told was strained almost to breaking point. That which Mr. Chamberlain wants is to ride a horse of another colour. He proposes that we shall bargain with the Colonies for more preference—giving them in exchange preference for their produce. Mr. Chamberlain himself tells us what this means. "If," he says, "you are to give a preference to the Colonies . . . you must put a tax on food." This is the price we are to pay in order to get more trade for the Mr. Featherstones of this country; and what would it be but taking from the poor and giving to the well-to-do? Of the old days of privilege, it has been said that "wretches were hanged, that jurymen might dine." May it never have to be said that the people's food was taxed that manufacturers might grow rich.

15, *Victoria Street, S.W., July* 22, 1904. Chas. Hunt.

The Crystal Palace District Gas Company's Circular—The References to Croydon and Carburetted Water Gas.

Sir,—I have no ground for controversy with my friend Mr. Helps, who has as much right to proclaim his enthusiasm for water gas as the Crystal Palace District Gas Company's Board have to set forth its disadvantages, as they find them, in a circular to their consumers.

Mr. Helps appears to have misunderstood one sentence in the circular, which he at first quotes correctly and then misquotes. We say that water gas "when mixed with coal gas seriously diminishes the efficiency of all gas-fires and cooking stoves, and causes them to 'light back.'" The word *all* applies to the serious diminution of efficiency; for all our fires and stoves have bunsen burners adapted to the use of pure coal gas. Therefore, when a varying mixture is supplied, the air supply to the bunsen burner is at fault; and we see no means of remedying it so long as we use water gas. To say that *all* gas-fires and cooking-stoves are caused to "light back" by a mixture of coal and water gas, is so obviously absurd that I am surprised Mr. Helps should have so misunderstood that sentence in our circular.

July 23, 1904. George Livesey.

Coking of Coke Dust and Breeze.

Sir,—Only one statement of Mr. Herring's letter in your issue of the 19th inst. calls for reply—viz., "There is no difference in its chemical composition," *i.e.*, between dust of anthracite coal and coke dust and breeze. Surely, Mr. Herring is not serious. An analysis by Mr. Hills shows that coke dust and breeze contain from 13 to 60 per cent. of ash. All the authorities on the analysis of bituminous coal put the ash as below 4 per cent. My own old contracts for bituminous coal limited it to 5 per cent.

As to the rest of Mr. Herring's letter, he is welcome to the "opinion" he "has formed;" but your readers will judge how far he is entitled to speak for "the rising generation of gas engineers." His assumptions remind one of the witticism of Professor Jowett upon a diatribe from an undergraduate—"We are none of us infallible, not even the youngest of us."

Palace Chambers, S.W., July 23, 1904. Hy. E. Jones.

Mr. Cranfield's Address and the Training of Junior Engineers.

Sir,—It has been a matter of great regret to me that I have been unable to write in support of Mr. Cranfield's address, as, after thinking over the subject, I am bound to say that I believe the policy outlined in my paper before the Midland Association would be the better one. Every effort should be made by all the Associations to focus more and more attention on the teaching of Gas Manufacture in the larger Technical Schools. Preparatory to such specialized teaching, however, must be a general science course. No student is able to take up such a highly complicated and scientific question as Gas Manufacture without the groundwork of a general scientific training. This done, however, I believe that the larger Technical Schools should specialize in this as one of their technological subjects, and that classes in Gas Manufacture should be started with suitable equipment. I know this has already been done in some of the University Colleges; but I think it should be extended.

I am not convinced that the Associations would be justified in contributing from their funds towards the travelling expenses of students to centres at which the courses are held. I imagine that the inducements of promotion in the profession would of themselves afford sufficient stimulus for students who are worth anything to take up courses of study.

Leamington, July 20, 1904. Thomas Berridge.

The Arrangement of Grids in Oxide Purifiers.

SIR,—Referring to the further letter from Mr. Livesey, of East Grinstead, appearing in your last issue, may we say that we do not propose to enter into any arguments as to our competence or otherwise to form or express a judgment on gas-making matters. That is a question we leave to those who know us; and it may stand for what it is worth. Neither was it, nor is it, our desire to write in any way provokingly, but solely in the interests of the technical matter under discussion.

As to the point mentioned by Mr. Livesey, it would appear to us that an ideal purifier containing oxide for the purifying medium, would not be expected to contain any passages of least resistance, but that the oxide should be so distributed as to be uniformly dense, and generally under such conditions as would offer the least possible resistance to the passage of gas, which would then pass through the whole mass simultaneously and equally—enabling the purifier to perform the very maximum duty its dimensions are equal to.

It is this desideratum that the Jäger system attains; and we make this statement not as interested manufacturers, but because it has been demonstrated practically by men whose competence and experience, as gas makers in the fifty odd gas-works where the system has been adopted, will not be contested.

SAM. CUTLER AND SONS.

Millwall, E., July 22, 1904.

The Dr. Kramers and Aarts Blue Water-Gas Process.

SIR,—In the report of the Dutch Gas Managers' Association meeting, on p. 180 of the last "JOURNAL," your correspondent has made a mistake. Giving the results obtained with the Dr. Kramers and Aarts apparatus, he wrote: "The results obtained were as follows, ordinary gas coke being used: 12 kilos of coke produced 2·4 cubic metres of water gas of a calorific power of 2800 per 1000 cubic feet, and if special care was taken the make was increased to 2·6 cubic metres."

What I said at Maastricht was: "The results obtained were as follows, ordinary gas coke being used: 1 kilo of coke produced 2·4 cubic metres of water gas of a calorific power of 2800 per litre," &c.

WATERGAS-MAATSCHAPPIJ SYSTEEM DR. KRAMERS EN AARTS,

Amsterdam, July 22, 1904. DR. ALPH STEGER.

Gas and Water Pipes and Railway Bridges.

SIR,—I notice in the "JOURNAL" for the 12th inst., under "Gleanings from the Committee Rooms," that it was stated in the case in question, by Mr. Pelham, of the Board of Trade, that there is an obligation on railway companies, "when interfering with a highway, to construct another one sufficient for all ordinary purposes of a highway, which purposes included pipes and cables for the service of the public." There is, I venture to think, no doubt but that gas and water authorities have power, under the Gas and Water Works Clauses Acts, to break up the road over or under a railway bridge where such road is dedicated to the use of the public, provided that the structure of the bridge is not interfered with, although railway companies often dispute such right. I may say that I have on several occasions had the question raised, and have successfully contested it. But the difficulty that gas and water authorities have to contend with is that railway companies in constructing bridges, do not in many cases comply with Mr. Pelham's definition, inasmuch as the bridges generally have only 18 to 24 inches in depth between the surface of the road and the structure; so that it is not possible to lay even a 6-inch main with a sufficient depth of cover. What I venture to think is required is power to compel railway companies, when constructing bridges under a highway, to give a minimum depth—say, 3 feet—between the top of girders or arch and the surface of the road. If the Board of Trade would insist on this being done, they would be rendering a service to gas and water authorities, and the railway companies would only be doing what, according to Mr. Pelham, they should do.

H. FRANCIS.

Devonport Water-Works, July 21, 1904.

A Faulty Reservoir.

SIR,—A reservoir 150 feet long, 50 feet wide, and 9 feet deep, which is usually kept filled with water up to 7 ft. 6 in., has for some years been losing by leakage 42,000 gallons per 24 hours.

The present bottom of the reservoir is constructed as follows:—

	Present condition.
12 inches concrete	Very porous.
2 inches cement	Now like sand.
One course of brick laid on edge .	These when laid were groated; but the cement between can now be broken easily with one's fingers.

It is proposed to alter the bottom by taking out the bricks and the 2 inches of cement, and replacing with 6 inches of concrete composed of 5 of limestone chippings and 1 of cement, finishing off with 3 of limestone dust and 2 of cement, well faced up.

Can any of your readers say whether the following be a stronger bottom: 6 inches of concrete, composed of 3½ limestone chippings and 1 of cement, and 3 inches to finish off composed of 2 of limestone dust to 1 of cement well faced up? Or, again, what would be a better method than either of the above? We do not intend to interfere with the 12 inches of concrete.

T. W. J.

July, 19, 1904.

The Worsborough Dale and Worsborough Gaslight and Coke Company, Limited, have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for a 73 ft. 6 in. diameter steel tank, 20 ft. 6 in. deep, complete with gasholder prepared for telescoping. The contract includes all excavations and foundations. The work is to be finished by the end of October.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills reported: Felixstowe Gas Bill, Swindon Corporation Bill.

Bills read the third time and passed: Arbroath Corporation Water Order Confirmation Bill, Dunfermline District Water Order Confirmation Bill, Lytham Improvement Bill, Melrose District Water Order Confirmation Bill.

Bills Royal Assented: Airdrie Corporation Gas Order Confirmation Bill, Barrow-in-Furness Corporation Bill, Bexhill Water and Gas Bill, Brymbo Water Bill, Crystal Palace District Gas Bill, Doncaster Corporation Bill, Filey Improvement Bill, Local Government Provisional Orders (Gas) Bill, Matlock and District Gas Bill, Minehead Urban District Council Water Bill, North-Western Electricity and Power Gas Bill, Preston Corporation Water Bill, Shipley Urban District Council Bill, Skipton Water and Improvement Bill, Southend-on-Sea Gas Bill, Ticehurst and District Water and Gas Bill.

The Selby Urban District Council Bill has been referred to a Select Committee, consisting of Lord Newton (Chairman), the Earl of Mayo, Lord Braye, Lord Vivian, and Lord Lawrence, who commenced their sittings last Thursday.

HOUSE OF COMMONS.

Monday, July 18.

The Question of Underground Water.

On the consideration of the Milwr and District Mines Drainage Bill, Mr. H. ROBERTSON moved the following clause giving compensation to owners and occupiers of mills on the Holywell Stream: "(1) If at any time or times, in consequence of the making of any tunnel or the execution of any works authorized by this Act, or of any works connected therewith, the flow of water from St. Winifred's Well into the Holywell Stream is reduced below an average daily quantity of 2½ million gallons, then the Company shall pay compensation to the person or persons injuriously affected thereby; and the amount of such compensation shall, failing agreement, be determined in the manner provided by the Water-Works Clauses Act, 1847. (2) Any compensation which the Company may become liable to pay under this section shall be a first charge upon the uncalled capital of the Company, and 25 per cent. of the subscribed capital of the Company shall remain uncalled until the expiration of one year after the completion of the tunnels authorized by this Act." The honourable member explained that a number of mills were worked by the waters of the stream, the source of which was about 200 feet above the sea-level. The Bill gave power to the promoters to tunnel a hill above the opening of the stream, and the owners of the mills and of the lands on which they stood feared that the tunnels would drain off the water. The onus of proving that the works authorized by the Bill caused any reduction in the bulk of the stream would lie on them.

Sir W. TOMLINSON, in seconding the motion, said he had come to the conclusion, having regard to the nature of the soil, that there would be considerable danger, in certain circumstances, of damage being done; and therefore he thought compensation should be provided for.

Mr. TENNANT (Berwickshire) asked the House not to accept a clause which would impose an unlimited liability upon the promoters of the Bill. The natural variation of the quantity of water in St. Winifred's Well was enormous; and if it diminished, it would be extremely difficult to assert that the well had suffered owing to the action of the promoters. He did not say that this scheme might not diminish the water in the well; but, on the other hand, it was impossible to say that it would do so. It was on these grounds that the Committee declined to provide for compensation. The object of the promoters was to drain mines which were believed to contain rich mineral ores; and he asked the House not to prevent the execution of a work which would be beneficial to the district.

Mr. BRIGG discussed the question from his practical experience of taking water in similar circumstances from the limestone formation, and came to the conclusion that the limit of 2½ million gallons was a very reasonable one for compensation.

Mr. J. W. LOWTHER (Chairman of Committees) hoped that the House would not accept the clause. He admitted that the law in reference to underground water was in an unsatisfactory state; but the consideration of a Private Bill of this character was not the occasion to amend the general law. To admit the clause would be to acknowledge a claim put forward by Holywell for water at least a mile away. Clause 7 of the Bill drew a line a mile from the town within which the Company could not carry on work; and this had satisfied the Committees of both Houses. It appeared that the works would be of great industrial advantage to the district, and it would be matter for regret if, in consequence of the introduction of such a clause, the Bill should be dropped by its promoters, and the locality be deprived of the advantage that might be hoped for from it. The clause went too far; for it not only gave a title to compensation for reduction of water in consequence of works authorized by the Act, but for reduction in consequence of "any works connected therewith"—nothing being said as to those by whom the works were "connected." The inhabitants of Holywell themselves might connect works, and though causing their own destruction, might take advantage of this clause to do a wrong to the Company. He would vote against the clause.

Mr. CRIPPS said that the last suggestion of the Chairman of Committees was almost too ludicrous, for under the Bill itself no works could be connected with those it authorized unless by the consent of the promoters. If sub-section (2) were dropped——

Mr. H. ROBERTSON said he was willing to drop it.

Mr. CRIPPS said in that case there was only left an ordinary clause providing for compensation if injury were done and proved.

After some discussion, the House divided, with the result that, by a majority of 27, it was decided to read the clause a second time. The second sub-section was then deleted, and another division was taken on the question that the clause, as amended, be added to the Bill. The result was a majority of 41 for the addition.

The following further progress has been made with Bills:—

Lords Bills read a second time and committed: Gas and Water Orders Confirmation Bill, Hamilton Gas Order Confirmation Bill.

Bills reported: Leeds Corporation (Consolidation) Bill, Leeds Corporation (Water-Works) Railway Bill [Lords], Manchester Corporation (General Powers) Bill [Lords], Newcastle and Gateshead Water Bill [Lords].

Lords Bills read the third time and passed: Dumbartonshire (Vale of Leven) Water Order Confirmation Bill, Ebbw Vale Urban District Water Bill, Gas Orders Confirmation (No. 2) Bill, Harrogate Water-Works Tramroad Bill.

GLEANINGS FROM THE COMMITTEE ROOMS.

THE writing of the intelligence from the Committee Rooms bearing upon the classes of Private Bills in which readers of the "JOURNAL" take an interest is not a burdensome task again this week. As a matter of fact, there has only been one measure under discussion; and that was the Bill promoted by the Newcastle and Gateshead Water Company. It has been before the Committee presided over by Sir James Woodhouse. The Tynemouth Corporation came along and contested the Bill very seriously; they having a wish to supply with water the district the Newcastle Company are asking for powers to append to their existing area. This additional district is a fairly extensive one. Nevertheless the Newcastle Company are in the happy position of being able to say that their water resources are ample, for at least 30 years to come, for the present area and the districts proposed to be incorporated, and they can complete the connections within six months. It seems that, in 1898, Tynemouth obtained permissive powers to supply the districts which were "the bone of contention" before the Committee last week; but in the year named they objected to be placed under any obligation in the matter. Willing enough they were now. Even so, it would take them three years to complete certain reservoirs now under construction and to give a supply. Mr. Charles Hawksley and Mr. E. M. Eaton gave evidence in favour of the Bill; but no evidence was called for the petitioners. It was rather fancied that the Tynemouth people saw they were playing a losing game; and even though Lord Hugh Cecil (as a member of the Committee) told them in his blandest manner that it would have an effect on his mind if no evidence were called to rebut the evidence of the local authorities that the Newcastle supply was the better, Tynemouth would not. However, Mr. Freeman, K.C., made a clever speech on their behalf; but it did not have any destructive result, for a majority of the Committee—so ran the Chairman's announcement—were of opinion that the preamble of the Bill was proved. During the discussion, the promoters dropped from the list of parishes proposed to be taken into their extension Ashington, Morpeth Castle, and Hepscott.

Newcastle and Gateshead Water.

The Bermondsey Clause.

The exhaustive inquiry by the Duke of Northumberland's Committee, which bore fruit in the revision and extension of the Bermondsey Clause, has not assisted the Gas Company supplying in Caerphilly in their application to Mr. Agg Gardner's Committee for the insertion of clauses on the same lines in the Provisional Order of the Caerphilly District Council. The Council are proposing to take electric current from the South Wales Electrical Power Company; and therefore Mr. Pelham, of the Board of Trade (who objected to the insertion of the Northumberland or any similar clause), considers that, in view of this, the undertaking will be less speculative than usual. That is a matter of opinion. The Council are tied hard and fast by the Power Company to the taking of a certain minimum quantity of electricity per annum. Supposing the custom is not equal to the minimum quantity who but the ratepayers will have to pay for the deficiency? The Council may, if they do not get sufficient private custom, of course, use the current in the lighting of the streets of Caerphilly in an extravagant manner. All the same, the ratepayers will have to pay for the waste. The illustrations of the contemptuous regard of the Board of Trade for the interests of the ratepayers are multiplying fast.

A Note for Unopposed Committees.

It has been noted with some amount of satisfaction in these columns that the Unopposed Committees now examine rather more minutely than of old the nature of the measures brought before them. This new keenness is not to the liking of our electrical friends. In another part of the "JOURNAL" reference is made to the very just action of the Unopposed Committee of the House of Commons in the matter of the reinstatement of an electrolysis clause in the Lothians Electric Power Company's Bill. This is resented by one of our electrical contemporaries, who remarks that it "strengthens the case of expediting the passing of the Electricity Supply Bill through Parliament this session, as the Bill makes for the abolition of the local consent, and at the same time gives an opportunity for all parties to express their views." This should direct the attention of members of the Unopposed Committee to the Electricity Supply Bill. They may not fully appreciate what is being done in the way of delivering over to the Board of Trade important electrical work that has hitherto had to be brought to the direct cognizance of Parliament through the introduction of Bills. There is an ill-concealed desire by all who are immediately interested, to rush the Bill through this session; and we hope they will not succeed. The measure is alluded to in the "Electric Lighting Memoranda" and in a special article on p. 247.

Land for Leeds.

In the course of the progress of the terrible Consolidation Bill from Leeds (which has taken up more time than any other that has come before the Police and Sanitary Committee this session), there was considerable discussion on the question of general powers to buy lands. The Committee were against the Corporation on this matter, and decided that the clauses in other parts of the Bill which gave them for various purposes a certain number of acres were sufficient. But these clauses did not include one for water; and on Tuesday the Committee gave the Corporation restricted power to purchase by agreement 200 acres, in addition to those already possessed, for water-works purposes.

GAS COMPANIES AND THE ELECTRICITY SUPPLY BILL.

The Select Committee of the House of Lords, presided over by Lord Wolverton, continued on Monday last week the consideration of the above-named Bill, which is promoted by the Board of Trade to amend the Acts relating to electric lighting. The discussion of the amendments submitted by the Board of Trade, the London County Council, the County Council's Association, the Association of Municipal Corporations, and the Gas Companies was proceeded with. Counsel appeared on behalf of the various parties interested.

At the outset, Mr. Pelham, representing the Board of Trade, said the four or five Companies having a statutory status for the supply of electricity, who had asked the Committee for exemption from the clause with regard to purchase, had been interviewed by the Board of Trade, and he did not think there was much difference remaining between the Board and them. Their Lordships had proposed to give to Companies having a generating station outside their area power to notify to the Board of Trade that they wished to be exempted from the provisions of the Act, with the result that, while they would be relieved from the obligation to sell, they would also be deprived of certain advantages they would derive from it. It was, however, desirable that the law should be uniform as far as possible with regard to generating stations which had been built under the powers of Special Acts. By the system proposed, the public would not know which Companies were still liable and which had given notice, and were therefore exempt from purchase. The procedure would be difficult and irregular, and there would be an uncertainty about it; and the Board would be unable to help the public. He had an alternative clause to submit to the Committee which would cover all the Companies who had applied to the Committee for exemption. One or two of them had expressed a preference for the proposal of the Committee to exclude them from clause 5, enabling the local authorities to purchase jointly. It must or must not be equitable that they should be exempted from it; but he ventured to suggest that the proviso to clause 4 which he now proposed would carry out the intentions of the Committee. It was as follows: "Provided that this subsection shall not, without the consent of the company to which they belong, apply to any generating station, mains, or other works authorized by a Special Act before the passing of this Act."

Mr. Moon, K.C., for the Metropolitan Electric Supply Company, said the amendment would give him the protection he asked in relation to clause 4; but he desired the same protection in regard to the other clauses. Mr. Coward, K.C., for the London County Council, took exception to the proposed proviso. The Committee had suggested these words: "Provided always that any existing company coming under the operation of this clause may, within six months from the passing of this Act, by resolution of the company forwarded to the Board of Trade, take none of the benefits and incur none of the liability created by this Act." The Chairman remarked that the Committee were very much inclined to keep to the words they adopted. Mr. Pritchard, on behalf of the Municipal Corporations, accepted the amendment; and the Committee agreed to it.

Mr. Pelham then submitted the following new clause for the protection of gas companies: "Nothing in this Act shall enable the Board of Trade by Provisional Order to authorize the compulsory acquisition of any land which, at the date of the first publication of the notice for the Order, belongs to a gas company and is used, or intended to be used, by them for the purposes of their undertaking." Mr. Hutchinson, representing the Gas Companies' Protection Association, accepted the clause. Hon. J. D. Fitzgerald, K.C., for the Municipal Corporations, suggested that the amendment should be extended to local authorities having gas undertakings. He would ask for the insertion of the word "undertakers," so that the clause should read "to gas undertakers." Mr. Pelham said the Board of Trade would not approve of this; and he did not think it ought to be asked for. The Committee decided to accept the clause with the substitution of the words "gas undertakers."

Lord R. Cecil, representing the Metropolitan Borough Councils, moved to omit from the third sub-section of clause 4, which provides for the transfer of the right of purchase from one local authority to another, the words "with the consent of the company." Mr. Coward supported the amendment; but Mr. Balfour Browne opposed it on behalf of the Electric Lighting Companies, urging that it would entirely alter the general law. Mr. Pelham stood by the clause as printed; and the Committee decided to allow the words to stand.

Mr. Coward proposed to add the following proviso to clause 4: "Provided always that any local authority having power to purchase any part of an undertaking being wholly or partly within the Administrative County of London may, subject to the provisions of this section, transfer such rights to the London County Council." He said the local authorities, at conferences held in 1898 and 1903, had passed resolutions asking the Council to obtain this authority. He urged the Committee most strongly, having regard to the peculiar position of London, to accept the amendment. Mr. Balfour Browne objected to it, because it altered the law, and made the Council the purchasing authority; but provided it was made clear that it was subject to the

consent of the company, he would not stand in the way. Mr. Pelham remarked that if the Council were to have any powers of purchase or working Orders, it should be exercised over the whole county and not over parts, which would lead to great complications. The amendment was accepted with a verbal alteration to make it clear that the consent of the company concerned was requisite.

Amendments submitted by the Gas Companies to omit clauses 4 and 5 were withdrawn, and an amendment to the latter clause ("Exercise of electric lighting powers by authorities jointly"), moved on behalf of the Metropolitan Electric Supply Company, and providing that no Provisional Order affecting a Company's area should be made without its consent, was refused by the Committee.

Mr. Coward moved a new clause with the object of giving the Auditors of the Board of Trade who inspect the accounts of electric lighting companies power to enforce their objection to the accounts submitted to them. He said the clause was important from the point of view of the local authorities in regard to purchase and to the consumers in connection with the periodical revision of the maximum price for current. Mr. Pelham opposed the amendment as placing further duties on the Auditors; and the Committee said they were not prepared to go into the matter."

Mr. Fitzgerald moved a verbal amendment to clause 10 ("Supply of electricity to premises having a separate supply"), the object of which was to relieve undertakers from the obligation to keep up an unnecessary reserve of power. The Committee accepted the amendment.

A new clause, moved on behalf of the London Gas Companies, to the effect that the Act should not apply to any place within the county of London, was not accepted by the Committee; nor was one submitted by Mr. Hutchinson, specifying that, before applying to the Local Government Board for sanction to the raising of any loan required for the purpose of carrying into execution any of the powers granted to a local authority by any Provisional Order under the Electric Lighting Acts, the authority should obtain the consent of the owners and ratepayers to such application, as nearly as practicable in accordance with the requirements of the Borough Funds Acts, 1872 and 1903; and the Local Government Board were required to submit to the ratepayers full details, signed by a responsible official of the local authority, of the proposed capital expenditure, and of the revenue expected to be derived therefrom.

The Bill, as amended, was passed by the Committee, and ordered to be reported to the House.

ELECTRICITY SUPPLY FOR CAERPHILLY.

A Bill to confirm a Provisional Order of the Board of Trade for the supply of electricity to Caerphilly and the district came on Monday last week before a Select Committee of the House of Commons, over which Mr. Agg-Gardner presided. A petition against the Bill had been presented by the Rhymney and Aber Valleys Gas and Water Company. Mr. Ram, K.C., on behalf of the promoters, said the object of the Bill was to enable the Caerphilly Urban District Council to supply electricity to Caerphilly, Aber, Senghenydd, and Llanbradach, which was the area over which the Council had jurisdiction. It was not intended by them to generate their own electricity, but it would be bought from the Electric Power Distribution Company of South Wales. A certain minimum quantity of current would have to be taken. The district it was proposed to supply had a population of about 10,000 people. Counsel was proceeding to deal with the petition against the Bill when Mr. Shaw, who represented the Company, said he did not oppose the preamble, but he desired the insertion of a clause with regard to the price to be charged. Mr. Ram (continuing) said the petitioners wanted the insertion of the Bermondsey clause, which would make the Council raise the price of the supply if necessary, so that it should be a self-supporting scheme, and would not at any time be a burden upon the rates. This, Counsel observed, would place in the hands of the Rhymney Company a weapon which would squeeze the project out of existence. At present there was no gas in some of the districts mentioned outside Caerphilly. Lord Bute and other colliery owners were in favour of the scheme, and it had also received the approval of the inhabitants of the district. Mr. Shaw said the area was a scattered mountain one, and not one in which there was any necessity for the supply of electric light. All he wanted to guard against was that the District Council should speculate in electricity, and if the speculation was not successful that their losses should fall upon the rates, and upon ratepayers who did not use the current. In fairness to the Rhymney Company, who were authorized to supply in the district, the Council should not be allowed to dump this electricity down, and sell below cost price. The Committee, however, passed the Bill.

LOCAL AUTHORITIES AND GAS AND WATER ORDERS.

Consents Dispensed With.

Three reports have just been presented to Parliament by the Board of Trade, in compliance with section 4 of the Gas and Water Works Facilities Act, 1870, setting forth their reasons for dispensing with the consent of certain Local Authorities to Provisional Orders applied for in respect of their districts.

An application for an Order was made by the Waltham Abbey and Cheshunt Gas Company, to empower them to construct and maintain additional gas-works and to raise further capital. The Cheshunt Urban District Council, at a meeting held on Jan. 14 last, decided to remain neutral; and the promoters asked the Board of Trade to exercise the powers conferred upon them to dispense with the consent of the Council. The Board accordingly appointed a Commissioner to hold an inquiry in the matter; but no representative of the Council attended. After consideration of all the circumstances of the case, the Board, on the recommendation of the Commissioner, decided to dispense with the consent of the Council, and grant the Order.

An application for an Order was made by Eliza Asbey, William Taylor Meeson, Elizabeth Wood, and George Wood, to enable them to maintain and continue existing gas-works, to construct further works, and to manufacture and supply gas at Rochford. All the necessary consents were obtained with the exception of that of the Little Stambridge Parish Meeting; and the promoters asked the Board of Trade to dispense with it. The Board held an inquiry at their office, and invited the attendance of representatives of the parish of Little Stambridge; but no one attended. It therefore did not appear to the Board that there was any ground for refusing to grant the statutory powers asked for; and they decided to grant the Order.

An application for an Order was made by the Meldreth and Melbourn District Gas and Water Company, Limited, to authorize them to construct and maintain gas and water works, and to make and sell gas and supply water within the parishes of Meldreth, Melbourn, and Shepreth in the county of Cambridge. The proposed scheme was opposed by the Meldreth and Shepreth Parish Councils, but was supported by the Parish Council of Melbourn, this parish being more than equal in population to Meldreth and Shepreth combined. The Melbourn Rural District Council also opposed the scheme; while the Cambridgeshire County Council supported it. The Board of Trade appointed a Commissioner to hold an inquiry into the matter of the application, and it was attended by representatives of all the local and road authorities concerned. After consideration of all the circumstances of the case, the Board decided to dispense with the consents of the Rural District Council and the Parish Councils, and to grant the Order.

HOUSE OF LORDS COMMITTEE.

Monday, July 4.

(*Before the Duke of* NORTHUMBERLAND, *Chairman, the Duke of* WELLINGTON, *Lord* EMLY, *Lord* CONGLETON, *and Lord* O'NEIL)

BARNET DISTRICT GAS AND WATER BILL.

This Bill, promoted by the Barnet District Gas and Water Company, for power to acquire lands, to construct additional works, and to raise further capital, has already been passed by a Committee of the Lower House.

Sir R. LITTLER, K.C., Mr. BALFOUR BROWNE, K.C., Mr. HONORATUS LLOYD, K.C., and Mr. D. C. BARTLEY appeared for the promoters. The petitioners against the Bill were: The Urban District Council of Finchley, who were represented by Mr. VESEY KNOX; the Great Northern Railway Company, represented by Mr. F. LANKESTER; the Marquis of Salisbury, by Lord R. CECIL, K.C.; the Metropolitan Water Board, by Mr. J. D. FITZGERALD, K.C., and Mr. E. CHARTERIS; the Herts County Council and the Hertford and Hatfield Rural District Councils, by Mr. CLAUDE BAGGALLAY, K.C., Lord R. CECIL, K.C., Mr. C. C. HUTCHINSON, and Mr. C. E. LONGMORE; and Mr. Perceval Bosanquet and others, by Mr. FREEMAN, K.C., and Mr. W. H. DICKINSON.

Sir RALPH LITTLER, in opening for the Bill, said that, in the case of the Barnet District Gas and Water Company, there was no complication between gas and water, because, by an Act passed some years ago, the gas and water capital was entirely separated. The whole of the capital of the Company had been issued and paid up with the exception of £40,000 of "D" water capital, of which £24,580 had been subscribed; leaving a margin of £15,420 of capital applicable to water purposes. Borrowing powers to the extent of £10,000 also remained applicable to water; making a total of £25,420. The works under the Bill were a new well and pumping-station at Bayfordbury, to the north of Berkhampstead, a conduit extending from there to a junction with the Company's existing main in Prospect Road, East Barnet, and a reservoir in the parish of Shenley, for the purpose of securing a high-pressure supply. By a clause inserted in the House of Commons, the amount of water that might be pumped from the new well was limited, except in cases of emergency, to 3 million gallons a day, and any wells within a mile were to be protected by compensation in money. The Company might also acquire, by agreement, 15 acres of additional land subject to certain restrictions with regard to underground water, and for the purpose of cleansing or repairing the works, the Company might discharge water into any available stream—paying compensation if damage were done to the banks. Authority was also given to the Company to break up roads outside their districts, and power to obtain water in bulk from anyone supplying within any adjoining area. This latter power was analogous to that which was introduced by the Government into the London water system. The Bill further provided for an increased capital of £200,000 with the supplemental borrowing power of one quarter, or £50,000. This capital was to be part of the water capital only; and the dividend was limited to 7 per cent. for the ordinary, and 6 per cent. for the preference capital. The old standard of dividend was 7 per cent., and it was proposed to adhere to this. The growth of the Company's district had been remarkable. In 1872, the Company was incorporated with a capital of £135,000, to serve a not very well populated district; but in 1883, and again in 1887, it was found necessary to come for more money powers. They had tried to get all the water they could at the Potter's Bar station; but they had found themselves obliged to cease pumping for two or three days each week, so as to allow the water to regain its old level. The well was 345 feet deep. At East Barnet, they had a well 300 feet deep. With all this capacity, the Company had an average daily supply of only 1,078,890 gallons. The average demand on the Company was for a million gallons daily. So they were absolutely approaching exhaustion in this matter. They had done all they could to find water within their district. They had spent £40,000 in one place, and £20,000 in another, and had only obtained 750,000 gallons. By 1921 they expected to need 2 million gallons, and by 1931 2½ millions. The first petition against the Bill with which he would deal

was that of the Hertfordshire County Council and the Rural District Councils of Hertford and Hatfield, who alleged that the navigation of the Lea and its tributaries would be injuriously affected by the works under the Bill, and that the Bayfordbury well, proposed to be sunk in the chalk, would seriously decrease the water in the Lea, and also the level of the water in the chalk; thus injuring the wells and springs in the neighbourhood. But the opinion of the Balfour Commission, supported by the Llandaff Commission, was that 40 million gallons could be obtained daily from the valley of the Lea, or, with proper storage, 52 million gallons. Of this amount 28 million gallons was pumped daily by the Companies; and there remained 18 million gallons out of which to take the 3 millions now asked for. The petitioners said the Company could obtain a further supply in their own district; but he submitted that the question of an alternative source ought not to be gone into. They alleged also that the proposals of the Bill were only to increase the rights of the Company for the purpose of a sale of the undertaking, and not in the public interest. This he absolutely denied. Objection was also taken in regard to the special provisions for the supply of Finchley; but this was a place on a higher level. They had been endeavouring to come to an agreement in reference to a constant supply for this district for some time past; and the provision was simply that the Company should, within a certain time, provide the supply to the higher districts of Finchley, but only to such an extent as they could supply by gravitation from their new reservoir. Within Middlesex, there was no water to be got; and therefore the Company went outside. The petitioners asked that the powers of the Bill should not enhance the value of the undertaking in the event of purchase, which was, however, not at all likely to take place; and they also asked that they should have a right to be supplied at a price not exceeding 4d. per 1000 gallons, although the Metropolitan Water Board had, in the course of a correspondence between them and the promoters, stated that if the promoters took these 3 million gallons from them, the price would be 9d. per 1000 gallons. Mr. Bosanquet in his petition alleged that water would be taken from under his property, and Mr. Woodhouse that the River Lea, which ran through his estate, would be dried up in the summer time. These were matters, however, which could in any case be met by compensation water. After referring to the petition of the Marquis of Salisbury, who alleged injury to the Lea as a trout stream, and that the water supply of Hatfield would be affected, Counsel dealt with the petition of the Metropolitan Water Board, who had acquired the rights of the New River Company and the East London Water Company over the water of the River Lea. The promoters, however, were not going to take water from the River Lea, but from the side of it; and in the water they would take no legal rights could be established. The Committee of the Water Board to whom the Bill had been referred had reported to that body that the provisions inserted by the Commons restricted the pumping to 3 million gallons daily, and that the only alternative was for the Board to supply the Barnet Company themselves. In a letter of the Board to the promoters, they said that if the proposal to construct the well at Berkhampstead were struck out, they would be willing to supply on terms. The Company asked for the terms, and were told that the Board would be willing to supply up to 3 million gallons a day at 9d. per 1000 gallons, subject to a ten-yearly revision. This meant that the water would have to be bought at 9d. per 1000 gallons, and pumped up at an additional 2d.—the estimate of the Hertfordshire people being 4d. per 1000 gallons. The present profit of the Company was £16,806; and the result of paying the Water Board 9d. per 1000 gallons and 2d. for pumping would be to reduce the profit to £9064. The amount now required to pay the dividends and charges, without additional works, was £13,752. Therefore there would be a deficit of over £4000. The proposition was absurd; and if they could not afford to supply at less than that, it was an idle one. He objected to their *locus*.

The Hon. E. CHARTERIS said the *locus* of the Board was not contested in the Commons. They had taken over the New River Company, whose intake was at Ware; and, by an Act of 1855, the water of the River Lea was, subject to leaving a sufficient quantity for navigation purposes, absolutely vested in the New River and East London Water Companies.

The Committee decided to allow a *locus* to the Water Board.

Mr. *H. Rofe* said he had considered the Bill and inspected the district of supply and the works of the Company. The yield of water from the three existing stations was not more than a million gallons per diem. At the present time, 19 gallons per head of the population was taken; but it would be more proper to take 25 gallons for the future estimate, and he thought 3 million gallons was the proper quantity to ask for the increased supply. He had inspected the area of the proposed well at Bayfordbury; and the probability was that the 3 million gallons to which they were limited would be obtained from the well. He thought the capital asked for was reasonable, considering the development of the undertaking.

In cross-examination by Mr. HUTCHINSON, witness said there was a 42-inch main from the Staines reservoirs passing through the district; but it would be unfortunate if the Company were deprived of their natural supply.

Mr. *R. E. Middleton*, examined by Mr. LLOYD, said he had visited the site of the proposed well, and had considered the question of the population the Company had to provide for. The Company were in want of water; and he agreed that 3 million gallons were required in excess of the present supply. He thought the scheme would provide this water, and enable the Company to give a constant supply to Finchley. Any injury to other wells that might arise in the neighbourhood of the proposed well could not go so far as the mile radius. He would put the cone of exhaustion at 600 yards.

In cross-examination by Mr. FITZGERALD, witness said the site was chosen within 300 yards of the Lea because it was convenient for the carriage of coal, had a low level, and the amount of sinking would be small.

Tuesday, July 5.

Mr. *G. R. Strachan*, examined by Mr. LLOYD, said that, having regard to the population to be served, he agreed with Mr. Rofe as to the supply of the Company, and that it would be necessary to provide 25 gallons per head a day. At present the Company were over-pumping their wells. There was no doubt they would obtain from the proposed well the 3 million gallons they required without any material injury being done to any one.

In answer to Mr. CHARTERIS, witness admitted that, if the Lea were not puddled, water would be drawn from it by the well.

Mr. *W. Whitaker*, F.R.S., F.R.G.S., corroborated the evidence of previous witnesses as to the suitability of the selected site for obtaining the water required.

In cross-examination by Mr. FREEMAN, witness said he had been consulted by the Barnet Company for years, and had suggested sites within their district, but not always with success, he was sorry to say.

Mr. *Thomas H. Martin*, the Engineer to the Company, gave evidence bearing out the statements made by Counsel in opening for the Bill. The Company's district was destitute of water, they had spent £20,000 at Finchley and found no water. Friern Barnet and Finchley were calling for a constant supply which his Company were anxious to afford; but it was not possible to do so with their present supply. He agreed with Mr. Rofe and Mr. Strachan that 25 gallons per head was a proper amount; and on this basis they would require the 3 million gallons asked for. Their existing wells had fallen very considerably because of the excessive pumping. After their experience within their district—getting only 250,000 gallons for £60,000 expenditure—they went to Bayfordbury. The 3 million gallons they proposed to take was no large proportion of the amount there. In regard to the £200,000 capital asked for, £105,000 would be required for the new works, including the pumping station, the land, the aqueduct, and the reservoir; £17,500 at New Barnet and East Barnet in driving adits; for new mains, £35,200; and for contingencies £25,000—making a total of £174,730. The balance would be required in connection with the supply of the higher portion of the district.

In cross-examination by Mr. HUTCHINSON, witness said it was his opinion that the wells belonging to the New River and East London Companies, which were some miles away, had affected the New Barnet well, although he believed that the limit of exhaustion was that of the cone to a certain extent. The water passed more rapidly to those wells than to the New Barnet well. The Company sold water to the local authorities at 1s. 3d. and 1s.; for trade purposes the price varied from 1s. 6d. to 1s., according to the quantity taken. If they took water from the Staines main, it would cost 9d. and 3d. for lifting per 1000 gallons; and they had to sell it at 9d. in Finchley.

Mr. *E. W. Drew*, the Secretary to the Company, examined by Mr. BALFOUR BROWNE, said he had made out an estimate of the financial result to the Company of purchasing water at 9d. per 1000 gallons from the Metropolitan Water Board. Taking the population in 1904 at 56,828, and the water (at 25 gallons per head) required at 1,420,700 gallons; population in 1911 67,153, water required 1,678,825 gallons; population in 1921 85,968, water required 2,149,200 gallons; population in 1931 111,012, water required 2,775,300 gallons, on the basis of a profit of 10s. per head—which was, roughly speaking, earned in 1903—they would have in 1911 a profit of £20,420, in 1921 £27,005, and in 1931 £35,770. Subtracting from this the cost of the water, they would require to buy at 9d., with 2d. per 1000 gallons for pumping—which in 1911 would amount to £11,356, in 1921 to £19,225, and in 1931 to £29,699—it would leave a profit in 1911 of £9064, in 1921 of £7780, and in 1931 of £6071. So that, as the amount required at present to pay dividends and interest on mortgages on the water undertaking was £13,752, the more water the Company supplied, and the more they bought from the Board, the less would be the net profit, and the lower would be the rate of dividend. He did not wonder that the Water Board were anxious that they should take the water from them at that high price.

Sir *James Dewar*, F.R.S., gave evidence as to the quality of the water supplied by the Company from their existing wells, which, he said, was quite equal to the well-known Kent water supply of London being drawn from the chalk.

Some local evidence was then taken.

Wednesday, July 6.

Mr. *Drew* was recalled this morning, and cross-examined by Mr. CLAUDE BAGGALLAY with respect to the table he had put in to show what the result would be upon the Company's revenue if they took their further supply from the Water Board on the terms offered, said he had taken the supply at 25 gallons per head; the present supply being 19·1 gallons. He had estimated that the expenses in connection with the increased water income would be 30 per cent. The reason he had revised his estimate was that they charged for the pumping a little lower down on the top of the 9d. He estimated that the cost of pumping the water delivered in bulk would be 2d. per 1000 gallons. Maintenance of works and pumping cost them at present about 2¼d. He had not included maintenance of works in the 2d. Pumping at present came to a little over 1·12d. per 1000 gallons for fuel, to which 0·33d. to 0·50d. must be added for wages; making the present cost of pumping about 1½d. It was just about right to say their water-rental was 1s. 4d. per 1000 gallons. This figure would not leave 7d. if they took water at 9d., because there would be 2d. for pumping and 1d. for interest on the capital outlay for the pumping-station, and the expenses of distribution and management would be 4d., or 1s. 4d. together. The clerical expenditure would increase with the number of consumers.

In cross-examination by Mr. J. D. FITZGERALD, witness said they required now about 420,000 gallons more than their existing supply. They had not intimated to the Water Board any of the terms or conditions under which they desired to be supplied, because they preferred to go for their own supply. They had paid the New River Company in 1899-1900 1s. per 1000 gallons for a certain quantity. They had not within his knowledge paid 1s. 3d. for road water. To take 400,000 gallons a day at 9d. would drop their dividend about half. They were paying 5½ per cent. on their water capital. He estimated £75,000 for the proposed well; but it would cost £30,000 to erect a pumping-station to take the water from the Board at the point of delivery.

Re-examined by Mr. BALFOUR BROWNE: When the East London Company were in straits for water, they purchased from the New

River Company at a price between 3d. and 4d. per 1000 gallons. This was a case of a willing buyer and a willing seller. When they paid 1s. to the New River Company, it was for a small emergency supply.

This closed the case for the Bill.

Mr. J. D. FITZGERALD then addressed the Committee for the Water Board. The Board, he pointed out, did not desire to supply water within the limits of the Company; the only reason they were intervening before the Committee was to protect their own water rights from attack. In offering water to the Company they were only seeking to enable them to get over their difficulty; but the Water Board did say that the proposed well would be an invasion of their rights. Counsel, after giving the history of the acquisition of water rights in the Lea by the New River and East London Companies, said the Committee were now asked to allow a well to be sunk which undoubtedly would have the result of appropriating some portion of the water of the Lea which was, by Special Act of Parliament, vested in these two Companies, and which would probably also anticipate some portion of the water now flowing to their wells, all of which water rights had been acquired by the Water Board at an enormous expenditure of public money. It was not to be taken that the figure of 9d. per 1000 gallons was one from which the Water Board could not depart. If it was to be that the Company were to take a supply up to 3 million gallons just when they liked—nothing in a wet year and the whole quantity in a dry season – then, under these circumstances, they must expect to pay a high price. But, if they would guarantee to take a minimum quantity, with a right to a further supply, the price to be revised after a certain number of years, and the water to be taken all the year round, the Board were perfectly willing to meet them in a fair way. The case of the Water Board was that these water rights were theirs—that the Barnet Company proposed under this Bill to take away a portion of these rights and transfer them free of cost to themselves. The Board claimed that the Company ought not to be allowed to take a large quantity of water which really belonged to the Metropolis, and had been acquired at enormous cost, without paying for it.

Mr. *W. B. Bryan*, the Chief Engineer to the Metropolitan Water Board, said the New River and the East London Companies had taken the whole of the flow of the Lea in dry seasons; and it would be a serious loss if there was any diminution in the quantity. The East London Company also possessed numerous wells in the valley of the Lea; and it was from them and the Lea that almost the whole of their supply was drawn, with the exception of 10 million gallons taken from the Thames. It had been suggested by the promoters that the bed of the Lea was puddled at Little Berkhampstead; but he did not agree with that. There would be no engineering difficulty in giving a supply from Staines to the Barnet Company. He thought 20 gallons per head per day in the absence of large trades would be a fair amount for the Barnet Company.

Cross-examined by Sir RALPH LITTLER: He could not agree that he thought 9d. per 1000 gallons was not a reasonable price. The site of the intended well might, within the limits of deviation, be brought within 30 yards of the Lea; but, even if it were sunk 60 yards away, it was still his opinion that they might extract water from the river. The East London Company had a month ago finished a well in the valley of the Roding, in Ilford. This well was very prolific; and they had evidently come across the best place for finding some of the surplus water flowing into the Thames.

Sir *Alexander Binnie* next gave evidence. He said that in the dry seasons since 1866 the two Water Companies had pumped the total flow of the Lea; and this had been done to such an extent that water had in recent years been pumped from the Thames into the Lea for navigation purposes. He considered that whatever water was pumped out of the proposed well would be water directly percolating from the Lea, or what was intercepted in its flow to the river.

In cross examination by Sir R. LITTLER, witness said he could not advise the Water Board to supply at cost price. He did not understand that Parliament had refused to allow the Water Board to supply in bulk in the district, but only to compete with the Company.

This closed the case in support of the petition of the Metropolitan Water Board.

Mr. CLAUDE BAGGALLAY, opening in support of the petition of the Herts County Council, said the whole question was whether the Company, not having exhausted all possible means of obtaining water within their district, should be allowed to go outside into another authority's district for their supply. The matter was an important one for Herts, where wells were failing, mills placed on the rivers for the sake of the water power had been unable to work for long periods together, rivers had failed, and fisheries had been destroyed. This deplorable state of things was not due entirely to shortness of rainfall, but was largely due to the pumping which had been going on. Unless the Company were shown to be in such a position that they could not possibly get water from within their neighbourhood or from the Metropolitan Water Board on reasonable terms, they ought not to be allowed to take more water from Herts.

Sir *John Evans*, the Chairman of the Herts County Council, and other local gentlemen and officials gave evidence in corroboration of Counsel's statement.

Thursday, July 7.

Mr. *A. L. Stude*, the Vice-Chairman of the Rural District Council of Hertford, said the Council in 1898 sunk a well 130 feet deep to supply Essendon. In 1902, they had to deepen it to get water; and from his knowledge of the hydrological condition of Hertfordshire, it was his opinion that the proposed well would very seriously affect the water interests not only of Essendon, but of the whole of that part of the Lea which was in Hatfield parish.

Mr. *W. Armstrong Smith*, examined by Mr. HUTCHINSON, said he had considerable experience in connection with water taken from the chalk; and had been for thirty years in charge of the water interests of Herts. He had prepared a table showing the increased pumping of the New River and East London Water Companies. The average daily quantity pumped by them had increased from 3·51 million gallons in 1881 to 12·04 millions in 1891, to 25·33 millions in 1901, to 28·42 millions in 1902, and to 23·69 millions in 1903. The effect of the pumping was the same as that of a continuous drought, and a permanent lowering of the water level in the chalk strata was brought about in Herts. Witness put in a table, which showed that the yield of the Lea per inch of rainfall per day was steadily diminishing. The yield of the Chadwell Spring had also fallen considerably.

Mr. *H. N. Dixon* said he considered that the underground waters in Herts were being seriously affected by the pumping, especially in the valley of the Lea. The falling off in the Lea was greatly disproportionate to the falling off in the Thames; and the facts and figures showed that the disturbing cause was the large amount of pumping.

Mr. *J. W. Restler* said he had examined the site of the proposed well, and he thought it was perfectly evident that pumping there must affect the Lea. The Rickmansworth Company took their supply from the watershed of the Colne, which was not so much drawn upon as that of the Lea, He should recommend the Barnet Company, before going to the Water Board, to get water within their own district, where they could get all they needed.

Mr. *Baldwin Latham* gave corroborative evidence.

Mr. *W. B. Keen* criticized the statements of the promoters as to the effect of buying the water necessary from the Metropolitan Water Board at 9d. per 1000 gallons. He submitted to the Committee a table which took in the first year under the new scheme, whichever it might be. Under the Company's scheme, the deficiency during the first year would be £5253, and under the Water Board's scheme the deficiency would be £5132.

This closed the case for the Herts County Council; and the Committee heard Counsel and evidence in support of the petition of the Marquis of Salisbury.

Friday, July 8.

Mr. FREEMAN addressed the Committee this morning on behalf of the landowners, urging that the present scheme was opposed to precedent, and that Parliament had rejected similar applications made by the South Essex Company and the New River Company. In both these instances Parliament had laid down the rule that water should not be allowed to be taken from a district where it was wanted for the supply of another district unless it could be shown that urgency existed for a further supply, and that no damage would be done to the district from which the water would be abstracted.

Mr. VESEY KNOX addressed the Committee for the Finchley Urban District Council, asking that the Company should be compelled to furnish a constant supply to the higher parts of the district.

Sir RALPH LITTLER then replied for the Bill, contending that the Company, having been given this district by Parliament, should be afforded all reasonable facilities for carrying on their business and earning an income on the large amount of capital which had been already expended. They supplied water of unimpeachable quality; and they felt that, having already spent £60,000 to little purpose in endeavouring to find water within their district, in face of their necessity for a further supply, they were entitled to go outside. He asked the Committee to consider whether, under the circumstances, it would be right for the Company to be put in the position of failing in their statutory duty. Supposing they had any chance of finding water in their district, they had not the money to try further. They had only £35,000 of unexpended capital left; and it cost a considerable amount to meet the annual expenditure for new mains in connection with the building operations that were going on. The Company would be helpless if they did not get the Bill. They had no money for further experiments, nor did they think from past experience that there was any place within their area where they could find the water required. A great number of the people served by them were Hertfordshire population. The Metropolitan Water Board claimed that they had bought up the Hertfordshire water, and would not allow anyone to touch it. But if this were the case, if the water belonged to the Board alone, what was the use of the Herts County Council, or the landowners, or any one else, saying anything, because the water would be taken to supply London if it were not taken by the Barnet Company. The Company felt that the Herts people had a right and interest in their water, and, in regard to the Hatfield and Hertford supplies, if it were proved to the satisfaction of the Local Government Board that they were injured by the well, the Company would afford a supply on arbitration terms. Lord Balfour's Commission had decided that the area of the Barnet Company should not form part of the Metropolitan Water Board district; and they were, by their opposition, now seeking to force the Company to take a supply in bulk from them. Nothing more unfair than this could be conceived. Of course, the Board were new to their work; otherwise they would not have allowed this opposition, because it was forcing the Company to do that which Parliament had said they should not do. If the Committee refused to pass the Bill, the Company could only go to the Water Board, and would be absolutely helpless in their hands, as there would be no powers to go to arbitration. He asked the Committee to come to a conclusion absolutely in accordance with the conclusions of the Balfour and Llandaff Commissions, by confirming to the Company the protection which clause 35 of the Metropolitan Water Board Act had given them, and not, by rejecting the Bill, to inflict a disaster on them and the 47,000 inhabitants they supplied.

The Committee deliberated in private, and on the re-admission of the public,

The CHAIRMAN said: The Committee do not feel themselves able to sanction the well at Little Berkhampstead. They wish to add this rider to their decision: "The Committee do not wish their decision to be regarded as founded on any claim which may have been put forward by Counsel on behalf of the Metropolitan Water Board to the whole of the waters of the watershed of the River Lea. On this point, they express no opinion." The Chairman added: "I do not know whether that rejects the preamble altogether, or whether the promoters would wish to go on with the other works?"

Sir RALPH LITTLER said so far as the Company were concerned they certainly would desire to retain the capital powers and the other machinery of the Bill, because they could not in any way see their way

to handing their district over to the Metropolitan Water Board. Therefore, what they would desire would be to seek for some other source of supply. He asked therefore that the Bill might proceed.

The CHAIRMAN: All we have decided upon is against the intended well and pumping-station at works No. 1. We have heard nothing against the other parts of the Bill.

An application on behalf of the Great Northern Railway, by Mr. Forbes Lancaster, for costs in respect of their appearance—the promoters having delayed giving their assent to the clause which was usual in such cases, giving the Railway Engineer supervision of works interfering with the railway—was refused by the Committee,

The CHAIRMAN expressing the opinion that there was great delay and unnecessary difficulty in all these negotiations between parties in coming to a decision.

Wednesday, July 13.

To-day the Committee considered the Bill as amended in accordance with their previous decision.

Sir RALPH LITTLER said an arrangement had been come to with respect to clause 15. It provided that the Company might, by agreement, obtain for the purposes of the water undertaking additional land within the limits of their supply, not exceeding in the whole 15 acres. Then these words had been put in, "and may, on all or any of such lands, execute, for the purpose of, or in connection with, the water-works, any of the works, and exercise any of the powers mentioned in or conferred by section 12 of the Water-Works Clauses Act of 1847." A doubt had been expressed whether section 12, which had very often been acted upon by water companies, being in very general terms, did give the right to sink wells or to do work for the purpose of, or in connection with, water-works; but it had been made plain in this clause.

Lord R. CECIL said certain objections were raised to clause 15 by the Local Government Board, which, under certain circumstances, would have been shared by the County Council; but, in view of the special evidence which had been given, the Council thought the promoters ought to have the power, in order to enable them to carry on their undertaking. They desired, however, to make it clear that this was not to bind their conduct in any future discussion they might have before Parliament in regard to water, but was to be the outcome of the special circumstances of this case.

Mr. FREEMAN, for the landowners, and Mr. LEES, on behalf of the Finchley Urban District Council, concurred.

The remaining clauses were then gone through, and, with amendments, agreed to; and the Bill was ordered to be reported.

LEGAL INTELLIGENCE.

HOUSE OF LORDS.

Monday, July 18.

(*Before the* LORD CHANCELLOR, *Lord* MACNAGHTEN, *Lord* JAMES OF HEREFORD, *and Lord* LINDLEY.)

Metropolitan Water Board v. New River Company—The Judgments.

Lord MACNAGHTEN, who read his judgment first, said that in this controversy between the Metropolitan Water Board and the New River Company several questions had been argued. The most important, and the only one of any difficulty, was question No. 1. In dealing with this question, their Lordships had to determine the meaning and effect of a group of clauses relating to limitation of dividends, which the framers of the New River Company's Act of 1852 had taken from the Water-Works Clauses Act, 1847, and, with the sanction of the Legislature, introduced, by incorporation, into their own Act. The Act of 1852 could not be described as an artistic or finished production. It was a careless and slovenly piece of work. The Water-Works Clauses Act, 1847, bore on the face of it a tolerably clear intimation that some care might be required in adapting it to the Special Act. It was to be applied so far as applicable. But the authors of the Act of 1852 had taken the Act of 1847 and simply pitchforked it, if he might use the expression, into the New River Company's Act of 1852. However, be that as it may, Parliament had sanctioned the incorporation; and the Special Act, as section 5 of the Act of 1847 declared, was to be read as if all the sections so incorporated were therein set forth. Though incorporated by reference, they were just as much part of the Act of 1852 as if they had been originally the language and composition of the New River Company. The question before their Lordships was therefore merely a matter of construction—a question of the construction of the Act of 1852. The respondents also treated it as a question of construction—but of the Act of 1847 rather than that of 1852. It was not very easy to understand exactly the position they took up. They seemed to regard the Act of 1847 as an enactment separate and distinct from the Act of 1852; standing apart as it were, but side by side with it—nominally incorporated, but not assimilated. In their view, as he understood it, the two Acts were for the most part incongruous and incompatible, capable of coalescing only here and there in pieces and patches. They relied principally upon sections 1 and 2 of the Act of 1847. They pointed out that section 1 declared in terms that the Act "shall extend only to such water-works as shall be authorized by any Act of Parliament hereafter to be passed which shall declare that this Act shall be incorporated therewith." They added that, in section 2, there was a clear and precise definition of the expression "the undertaking" admitting of no latitude of construction in the event of there being anything in subject or context repugnant thereto. He agreed that, in section 2, the expression "the undertaking" was defined as meaning "the water-works and the works connected therewith by the Special Act authorized to be constructed," and that this definition was not accompanied by the qualifying words to be found in section 3. But, speaking for himself, even adopting the view that the two Acts were, for the purposes of the question before their Lordships, to be treated as standing side by side, he did not think that the difficulties were quite so formidable as the learned Counsel for the respondents represented them to be. As their Lordships knew, these Clauses Consolidation Acts were passed in two batches, and in two different sessions. One batch was passed in 1845, the other in 1847. The 1845 Acts were apparently intended to attach to every Special Act subsequently passed to the subject-matter of which they might be germane. The Acts passed in 1847 were not to extend or apply to any Special Act subsequently passed, unless specially and in terms incorporated therewith. This was really all that was aimed at in section 1 of the Water-Works Clauses Act, 1847. As regarded section 2, the difficulty suggested by the learned Counsel for the respondents was more apparent than real. In the Act of 1847, as in every other Clauses Consolidation Act, whether passed in 1847 or in 1845, there were two groups or sets of definitions or interpretation clauses, each in a separate section—one for the purpose of the Consolidation Clauses Act itself, the other for the purpose of the Special Act as well. Now the definitions in clause 2 were for the purpose only of the Water-Works Clauses Act, 1847. The definition of the expression "the undertaking," and the corresponding term "the undertakers," applied only to those expressions in the Act of 1847. It did not necessarily extend or apply to the same expressions when found in the Special Act. Indeed, the whole difficulty, if he might say so with all deference, came from a misapprehension of the proper office of section 2 of the Water-Works Clauses Act, 1847. Before dealing with the construction of the clauses "with respect to the amount of profit to be received by the undertakers when the water-works are carried on for their benefit," there were only one or two general observations which he would like to make. In the first place, it must be borne in mind that the language of Acts of Parliament of this class was to be treated, as Chief Justice Tindal observed in *Parker v. Great Western Railway Company*, "as the language of the promoters of them. They ask the Legislature to confer great privileges upon them, and profess to give the public certain advantages in return." "Acts passed under such circumstances," he added, "should be construed strictly against the parties obtaining them, but liberally in favour of the public." Now in 1852, the New River Company came to Parliament for further powers. In their Bill—either of their own free will or at the instance of the Parliamentary Committee, it mattered not which—they proposed to insert a group of clauses pointing to limitation of dividends—clauses in favour of the public or a section of the public, who might hope some day or other to have their water-rates reduced in consequence. The Legislature allowed their Bill to pass into an Act on the faith of the advantage to the public to be derived from these and other clauses. It seemed to him out of the question to permit the Company, having got what they wanted, to come forward now and say: "It is quite true that some expectations were held out about the possible limitation of our dividend in the distant future. Our normal dividend was about 4 or 5 per cent. then—a 10 per cent. dividend was not in sight. It was really hardly a practical question. However, something was said about limitation of dividends. But when you come to write out the clauses referred to, and to write them out with the help of definitions to be found in the Water-Works Clauses Act, 1847, you will see the thing will not work. It is not intelligible. You cannot hold us bound by such nonsense." From the time of Lord Eldon, Acts of this class had always been held to be parliamentary bargains—between the promoters on the one hand and Parliament on behalf of the public or a section of the public on the other. How could the promoters escape from their bargain by proving that their offer, construed literally, was unintelligible and illusory? If the language of the Act of 1852 could be construed so as to give effect to the bargain as understood, or meant to be understood, at the time, it was the duty of the Court so to construe it. Now he came to clause 75 of the Water-Works Clauses Act, 1847, which must be construed as a clause written out at length in the Act of 1852. What was the difficulty? It said: "The profits of the undertaking to be divided among the undertakers in any year shall not exceed . . . . the rate of £10 in the £100 by the year on the paid-up capital in the undertaking . . . . . unless a larger dividend be at any time necessary to make up the deficiency of any previous dividend which shall have fallen short of the said yearly rate." The respondents said that there were two expressions in this clause which made it, when strictly construed, absolute nonsense. There was the expression "the undertaking," with the correlative term "the undertakers," and there was, besides, the expression "paid-up capital." Well, "the undertaking" was obviously the undertaking of the New River Company. There was but one undertaking. Up to the year 1852, there had been, as the special case found, "only one undertaking of the New River Company—only one body of Directors, only one capital, and only one dividend declared from time to time." The definition of the expression "the undertaking" in section 2 of the Act of 1847 did not really create any difficulty when the proper office of that section was understood. But, in any case, it was impossible to misunderstand the meaning of the expression "the undertaking" in section 75 of the Act of 1847 when the section was read and construed as a section of the Act of 1852. The whole Act must be read together; and there were other sections in the Act of 1852 in which the expression "the undertaking" or "their undertaking" occurred, referring plainly to the entire undertaking of the New River Company. The undertakers were obviously the Corporation of "The Governors and Company of the New River brought from Chadwell and Amwell to London" as representing the profit sharers in the undertaking—that was, the persons holding the Adventurers' shares and the King's shares; two bodies without any voice at all in the management of the concern but entitled to the profits equally between them. For all practical purposes, they were one. As regarded the expression "paid-up capital" he failed to see the difficulty. The New River Company were, no doubt, a very peculiar body. They had not a paid-up capital, or a registered capital at all like modern companies. But their undertaking had been built up by the expenditure of money contributed equally in respect of the Adventurers' shares and the King's shares. If there had been nothing in the Act of 1852 to fix the amount of the paid-up capital of the Company, he apprehended that, on the happening of the event contemplated in section 80 of the Act of 1847, it would

have been competent under the provisions of this section to inquire into and ascertain the amount of the paid-up capital of the Company. There was, however, no difficulty on this score. No inquiry was necessary. Section 4 of the Act of 1852 declared that "the capital of the Company already raised and expended shall be deemed to be £1,519,958." This figure must have been furnished by the Company themselves, and must have been intended to be taken as the paid-up capital for the purpose of section 75 of the Act of 1847. The suggestion that it was inserted in the Act for the purpose of giving some assurance of solvency—some confidence or comfort—to persons who might propose to advance money to the Company was, he considered, more ingenious than sound. There was not, he thought, any substance in the argument founded on the saving clause, section 75 of the Act of 1852, or in the suggestion that, though the undertaking was apparently one, the Company were really two concerns rolled into one—a water company and a land company, each having a separate undertaking, because it possessed a large and valuable estate in surplus lands which it was not under any obligation to get rid of. So much for question No. 1. No. 2 was closely connected with No. 1. The answer to it was involved in the answer to the former. There had been only one undertaking of the New River Company throughout their history. The fact that the accounts of the Clerkenwell Estate and its other property not directly used for or connected with the water supply were not to be submitted to the Board of Trade Auditor seemed to him to be quite immaterial. Question No. 3, relating to land-tax, was disposed of during the argument. On these three matters, the decisions of the Arbitrators seem to be right and ought, he thought, to be restored. As regarded question No. 4, he considered it was impossible to add anything usefully to the judgments of the Arbitrators and the Court of Appeal. He therefore moved their Lordships that the appeal of the Water Board be allowed, with costs, both here and below, and that the cross-appeal of the New River Company be dismissed with costs.

Lord JAMES OF HEREFORD said the main question before their Lordships for decision in this case was whether, on the true construction of the New River Company's Act of 1852, and of the Water-Works Clauses Act, 1847, the limitation of profits mentioned in the 75th section of the latter Act applied to the profits of the New River Company. The Commissioners forming the Court of Arbitration had held that section 75 did apply; while the Court of Appeal had determined that it did not. During a period fruitful of useful legislation, the Water-Works Clauses Act, 1847, was passed. Its objects were set out in the title, "An Act for consolidating in one Act certain provisions usually contained in Acts authorizing the making of water-works for supplying towns with water." But by section 1, the operation of the Act was to "extend only to such water-works as shall be authorized by any Act of Parliament hereafter to be passed which shall declare that this Act shall be incorporated therewith, and all the clauses of this Act, save so far as they shall be expressly varied or excepted by such Act, shall apply to the undertaking authorized thereby so far as the same shall be applicable to such undertaking, and shall, with the clauses of every other Act which shall be incorporated therewith, form part of such Act and be construed therewith as forming one Act." In the definition clauses, they found that "'the undertaking' shall mean the water-works and the works connected therewith by the Special Acts authorized to be constructed;" and "'the undertakers' shall mean the persons by the Special Act authorized to construct the water-works." "The expression 'the water-works' shall mean the water-works and the works connected therewith by the Special Act authorized to be constructed." Section 5 dealt with the manner of incorporation, so that "all the clauses of this Act so incorporated, save so far as they are expressly varied or excepted by such Act, form part of such Act, and shall be construed as if such clauses were set out therein with reference to the matter to which such Act relates." There were other sections in the Act, conferring powers and controlling procedure, to which it would be necessary to refer; but the important provision upon which the controversy turned was in the 75th clause, which enacted: "The profits of the undertaking to be divided among the undertakers in any year shall not exceed the prescribed rate, or, where no rate is prescribed, they shall not exceed the rate of £10 in the £100 by the year on the paid-up capital in the undertaking which in such case shall be deemed the prescribed rate, unless a larger dividend be at any time necessary to make up the deficiency of any previous dividend which shall have fallen short of the said yearly rate." In 1852, the New River Company's Act was passed. The preamble set out the very extensive powers that were sought to be obtained. Section 2 incorporated the Lands Clauses Act, but limited the application of the incorporation "to the works or undertaking by this Act authorized," "but not to any works constructed or lands acquired by the Company previous to the passing of this Act." Section 3 enacted that the Water-Works Clauses Act, 1847, with certain exceptions, "shall be incorporated with this Act." There was a limitation in respect of accommodation lands and mines; but in other respects the incorporation was general and complete. Other important provisions were to be found in the Act of 1852. Section 4 enacted that "whereas the capital expended by the Company in carrying out and completing their works now in existence amounts to the sum of £1,519,958 and upwards, be it enacted that the capital of the Company already raised and expended shall be deemed to be £1,519,958." Section 5 set out the limits of supply by the Company so as to bring the whole area within the Act. Section 7 enumerated the extensive works to be constructed. It was stated at the Bar that all the water supplied by the Company would pass through some portion of the works so authorized. Powers to borrow money were given by sections 14 and 15. There were other sections conferring powers, creating offences, and regulating procedure which applied to the whole concern, and were not confined to the portion of the undertaking authorized by Special Acts. A clause most relied upon by the respondent's Counsel was the 75th, which reserved all existing rights, privileges, and exemptions to the Company, "except so far as the same are necessarily altered by this Act," which, of course, must mean after the incorporation of the Act of 1847. As he had said, the question before their Lordships for determination was whether the 75th section of the Act of 1847 applied to the whole of the New River Company's undertaking or only to the portion of it authorized by the Act of 1852. In support of the view that the incorporation did not apply to the entire undertaking, the respondents mainly relied upon the express words in clause 1 of the Act of 1847, upon the peculiar constitution of the New River Company in respect of shareholders and capital, and upon the saving clause—the 75th section of the Act of 1852. In considering the meaning to be applied to the enactment that the Water-Works Clauses Act, when incorporated, shall apply "to the undertaking authorized by the Special Act," no doubt difficulty arose which could only be solved by searching for the intention of those who framed the Acts of 1847 and 1852. If the narrower view be allowed to prevail, and if it were sought to apply the incorporated Acts only to the new works constructed after 1852, the answer was that such limited application was apparently an impossibility. It must be remembered that the whole of the Act of 1847, with certain defined exceptions, was incorporated in the Act of 1852. There were several sections and groups of sections in the Act of 1847 which, if applied at all, must be applied to the whole undertaking, and could not be limited in application. For instance, the following sections, among others, might be so regarded: Section 27 and following sections, sections 35 to 37 (constant supply to be maintained), section 48 (power for inhabitants to lay pipes), sections 58 to 62, referring to offences which could not be held to be offences within the limited area only, and section 68, creating the legal machinery for the recovery of the water-rates. Throughout the very able argument presented to their Lordships on behalf of the respondents, he did not discover that any feasible theory or method of application of the incorporated Act in a limited sense was suggested. In his opinion, the difficulties in the way of such a limited application were insuperable, and therefore it could not be maintained. On the other hand, as the Act of 1847 was in part incorporated in that of 1852, effect must be given to that incorporation. If the limited views he had referred to be accepted, the incorporation was practically nullified; but by accepting the wider method of construction, and applying the incorporation to the whole of the New River undertaking, complete effect was given to the intended incorporation. The Act of 1852 in many particulars affected and regulated the whole uudertaking. The new works improved and altered the working of the old undertaking. As he had mentioned, all its water passed through the new works. The Act of 1852 contained many provisions which, in terms, referred to the Company and their works generally, and not to the new portion only. Therefore, as a matter of construction, and also from the necessity of applying the incorporation, he had come to the conclusion that the limited view sought to be placed upon the incorporation by the respondents' Counsel could not prevail. But other arguments were adduced against the limitation of dividends under the 75th clause of the Act of 1847. It was said the New River Company were peculiar in their institution. Those who were interested in the Company were not all shareholders; and capital in the ordinary sense of the word did not exist. It was true that some grounds for these assertions could be found in the history of the Company; but he thought that to all these objections good answers had been given. Section 4 of the Act of 1852 gave to the Company a positive fixed amount of capital—£1,519,958. Whether this fixing of statutory capital was for the express purpose of applying the limitation-of-dividend clause need not be determined; but it certainly removed any difficulty in the way of carrying the limitation into effect. The New River Company's Act of 1866 also recognized that the capital sum declared by the Act of 1852 was held by persons who, for all practical purposes, were to be regarded as shareholders. In respect of the effect of the saving clause, the 75th, in the Act of 1852, he agreed with the view expressed by Sir Edward Fry—that the words "except so far as the same are necessarily altered by this Act" deprived the section of any operative effect upon the incorporation. For these reasons, he was of opinion that the judgment of the Arbitration Court delivered by Sir Edward Fry was correct, and that the judgment of the Court of Appeal must be reversed. In relation to the other matters before them, referring to the interests of the New River Company as landowners, and to the sinking fund, he contented himself with saying that the judgments of Sir Edward Fry and of the Court of Appeal were in agreement, and that with these judgments and the reasons given for them, he entirely concurred.

Lord LINDLEY said he did not propose to trouble their Lordships with any observations on these appeals so far as they related to the land-tax and the sinking fund. It was sufficient to say that, in his opinion, the decision of the Arbitrators on these two matters was plainly correct, and he could not usefully add anything to the reasons for their decision. The question whether the Arbitrators or the Court of Appeal were correct on the application to the New River Company of section 75 of the Water-Works Clauses Consolidation Act, 1847, which limited the divisible profits, was much more difficult. The difficulty arose from the fact that the Act of 1847 consisted of a number of clauses framed for ordinary water-works companies and intended by the Legistature to be applied to them, but which clauses were not framed for, and were not easily adapted to, the New River Company, or to the new works authorized by that Company's Special Act of 1852. The third section of the Special Act was clear and distinct. It incorporated the whole of the clauses of the General Act of 1847, with one or two exceptions, which had no bearing on the questions to be decided. The two Acts had to be read together and worked together; they had to be applied to the New River Company not only when making the additions and improvements which were mentioned in the Special Act, but also to the Company and their undertaking after such additions and improvements had been made. The language of the General Act must, if possible, be so construed as to give effect to the later Act which dealt specially with the New River Company. The Special Act of 1852 was the governing Act; and this must not be lost sight of. The works authorized by the Special Act were enumerated in section 7 of that Act. When examined, these works were found not to constitute any works separate and distinct from the older works of the Company, but to be additions to them—absolutely useless without them, but with them forming a new whole, in other words, an enlarged undertaking authorized by the Special Act. If the new works only were regarded, they did not constitute an undertaking of any kind or in any sense; and to confine the definitions in the General Act to the new works, to the exclusion of the old, was to render the Special Act

absolutely useless and unworkable after the new works had been once constructed. So to interpret the provisions of the General Act of 1847 was, in his opinion, erroneous, and was opposed to the sound general doctrines that earlier statutes must give way to those which were later, and that general enactments must give way to those which were more specific, and that general words must be considered with reference to the subject-matter to which they had to be applied. This was pointed out very clearly by Lord Blackburn in the case of *River Wear Commissioners v. Adamson*. The first part of section 1 of the General Act of 1847 did not appear to him to present any difficulty. It said: "This Act shall extend only to such water-works as shall be authorized by an act of Parliament hereafter to be passed, which shall declare that this Act shall be incorporated therewith." This was only another way of saying that the Act of 1847 should not apply to any company until it was made applicable by a Special Act. This part of section 1 ceased to apply to any Company so soon as a Special Act made the Act of 1847 applicable to it. The second part of section 1 of the Act of 1847, and the definition sections 2 and 3, must be read into the Special Act, and be read as part of it (section 5 of the Act of 1847). But this must be done so as to give effect to the intention of the Legislature in passing the Special Act, and not to frustrate such intention. The definitions in the General Act of the words "undertaking" and "water-works" gave rise to difficulties; for these words were so defined as to be limited to works authorized by the Special Act to be constructed. If in this case the undertaking authorized by the Special Act meant the new works to the exclusion of the old, the Special Act was rendered useless, except so far as it authorized such new works; but if the definition in the General Act, when applied to the New River Company, was construed as meaning the new whole undertaking composed of the new works and the old, full effect was given to the Special Act, and all difficulty vanished. The Arbitrators evidently saw the difficulty and appreciated it. They so construed the two Acts as to overcome the difficulty and give effect to the Special Act. In his opinion, their conclusion was to be preferred to that arrived at by the Court of Appeal, which adhered to the narrower meaning of the words in the General Act, notwithstanding the consequences occasioned by so doing. The difficulty as to capital was another which arose when the Act of 1847 had to be applied to the New River Company. Before the Special Act of 1852, a considerable sum of money had been raised and spent in constructing the works of the Company. Such money was contributed by those who shared the profits of the undertaking. The money was not borrowed, and was not a debt for which the Company could be sued. It was really capital contributed by those who shared profits; and it was raised and expended. The Company had no other capital. They were not constituted with any nominal capital, and there was no distinction applicable to the Company between paid-up capital and capital not paid-up. Under these circumstances, the wording of sections 75 to 80 of the Act of 1847 might have been thought hardly applicable to the Company; but the difficulty of applying these sections was, in his opinion, completely removed by section 4 of the Special Act. This section fixed the amount of the capital of the Company raised and expended. This sum, therefore, was by statute made the paid-up capital in 1852; and there was no more and no less now than then. There was what was called borrowed capital; but this did not affect the meaning of paid-up capital in the Act of 1847. The saving clause, section 75 of the Act of 1852, might have excluded the application of sections 75 to 80 of the General Act to the Company if the saving clause had not been qualified and cut down by the words "except so far as the same are necessarily altered by this Act." But, having regard to these words, the clause had, in his opinion, been properly construed by the Arbitrators; and it could not exclude the sections limiting the amount of divisible profits contained in the General Act and incorporated in the Special Act. As regarded the Clerkenwell Estate, the special case stated distinctly that it was part of the Company's undertaking—that there was only one undertaking, and that the rents formed part of the profits of that undertaking. Under these circumstances, the Arbitrators were right in the way they dealt with them. He had not attempted to give an exhaustive judgment in the case. He had dealt only with the difficulties which appeared to him to require special notice. The conclusion at which he had arrived was that the decision of the Arbitrators was right on all points, and that the appeal of the Metropolitan Water Board from the Court of Appeal should be allowed, and the cross-appeal be dismissed.

The Lord Chancellor, who read his judgment last, said: I am not surprised that, in the misapplication of a model form of statute by a private chartered company to its own undertaking which had existed for many years and before company legislation had assumed the form now in use, such an effort by a short cut to do what, if done at all, should have been done by carefully considered special legislation, has produced a heterogeneous and incongruous collection of provisions which has given rise to the great difference of judicial opinion which exists in this case. This difference is mainly upon a provision of section 75 of the Water-Works Clauses Act, 1847, which limits the amount of profits which the undertakers may divide. I believe it to be true that no Court is entitled to assume, in construing a statute, that the Legislature has made a blunder; but though this principle is an important one, it has never been applied, I think, to Private Acts, of which it has been often said that their provisions are the language of the parties interested, to which the Legislature has given its sanction but has not assumed responsibility for the drafting. I think myself therefore at liberty to come to the conclusion that a blunder was made by the promoters of the New River Company's Act of 1852 in the mode in which they incorporated the Water-Works Clauses Act, 1847. But I do not think myself at liberty to do violence to the language of the Act, or to imply the existence of words in the Act which are not there, in order to avoid the conclusion that the Act has not done all that it was intended to do. There is, in the New River Company's Act, a provision that the application of the Water-Works Clauses Act thus incorported is not to apply where it is inconsistent with, or inapplicable to, the undertaking. I am unable to say that this model Act is consistent with the constitution or provisions of the New River Company's charter. I think there is neither an "undertaker," nor a "capital," nor yet a "dividend," in the sense in which these words are used in the Water-Works Clauses Act; and, without going through the whole of the argument elaborated by the Court of Appeal, I agree with that Court, and I am, therefore, unable to concur with your Lordships in a decision which overrules it.

It was then agreed that the order appealed from be reversed, that the respondents pay to the appellants the costs both here and below, and that the appeal of the New River Company be dismissed with costs.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Friday, July 22.

(*Before the* Master of the Rolls *and Lords Justices* Stirling *and* Mathew.)

Lambeth Water-Works Company and Southwark and Vauxhall Water Company v. Metropolitan Water Board—The Sinking-Fund Appeals.

Mr. A. B. Shaw appeared to-day for the Metropolitan Water Board in these cases, and said the Court would remember that the Court of Arbitration constituted under the Metropolis Water Act, 1902, had decided that the undertakings of the two Companies ought to be valued as subject to the obligation to contribute to the sinking fund of the Chamberlain of London. They had decided the same point in the case of the East London Company, and their decision in that case had been affirmed by the Court, and had recently been further affirmed by the House of Lords (see *ante*, p. 265). He now asked the Court to make an order in favour of the Board against the Lambeth and Southwark and Vauxhall Companies similar in form to that made against the East London Company.

Mr. R. J. Parker appeared for the Lambeth Company; and Mr. Du Cane for the Southwark and Vauxhall Company.

The application was granted.

EXETER QUARTER SESSIONS.—Saturday, July 23.

(*Before Mr.* J. Alderson Foote, K.C., *Recorder*.)

The Assessment Appeals of the Exeter Gas Company.

Judgment was delivered to-day in the appeals of the Exeter Gas Company against the assessment of their property by the Assessment Committees of Exeter and St. Thomas. The proceedings on the appeals were reported in the last volume of the "Journal," pp. 169 and 319.

The Recorder said: These two appeals, which were heard together, involve, first, the ascertainment of the total rateable value of the Exeter Gaslight and Coke Company regarded as a whole; and, secondly, the proper distribution of the rateable value as ascertained between Exeter, St. Thomas, and Heavitree. In regard to the first point, it was agreed by the parties that it would be sufficient for me to ascertain the rateable value, and that the gross estimated rentals could in each case be calculated by the Overseers. In regard to the second, it is true that Heavitree is not a party to either of these appeals. But it is impossible to ascertain the true rateable value for Exeter and St. Thomas without incidentally doing the same for Heavitree; and I propose to state the result for that parish also, which will doubtless be adopted by the Overseers. The principles of rating, as applied to gas companies, are in practice well known. The net receipts are first ascertained by subtracting the expenses from the receipts. From the net receipts a certain amount is deducted as the tenant's share. The remainder is the landlord's share—that is to say, it includes the amount necessary for repair and maintenance, the rent, and the rates. By again deducting the amount required for repairs and maintenance, and that which will be required for rates on the rent when ascertained, the net rateable value of the whole concern is arrived at. The figures appealed against show a net rateable value for Exeter of £3755 (including £255 for offices); and for St. Thomas a net rateable value of £3800. The rateable value for Heavitree being £177, the total rateable value of the concern is thus taken at £7732. It is admittedly impossible to support the figure of £3755 rateable value for Exeter by any of the ordinary methods of calculation; and Counsel for the Exeter Assessment Committee relied upon an offer contained in the correspondence to reduce this figure to £2505 (including £255 for offices). This offer was not accepted. In order to support even this reduced figure, the expert witnesses for Exeter found it necessary (1) to assume the amount actually paid in dividend, interest, and Directors' fees in 1902 as equivalent to the "net receipts," and (2) to assume that two-thirds of the figure so arrived at was the landlord's share. For neither of these assumptions is there any precedent or authority; and the second of them is a mere rule of-thumb or empirical guess. I do not feel myself at liberty to adopt either of these methods; and I have therefore to construct a valuation for myself upon the usual and orthodox lines, guided, of course, by the valuable evidence of the experts on both sides. Unfortunately, it is far more important for St. Thomas to ascertain the value of the works or indirectly productive part of the concern than to calculate the value of the mains or directly productive part; and on this latter question, therefore, I cannot regard the evidence for either of the respondents as entirely satisfactory. The evidence for the appellant Company is, of course, not to be accepted without critical examination; and on the important items of tenant's capital and statutable deductions, I have had to form my judgment, and construct a valuation for myself. In the result, I have arrived at the following figures: Total rateable value of the whole property (after deducting rates on that amount), £6171; rateable value of works in St. Thomas, £3200 (deduct rateable value of mains and Exeter offices), £2970; deduct £255 for offices in Exeter (agreed), £255; making a total of £2716. If this £2716 be divided in

the agreed proportion of the receipts in the several parishes (viz., 78·84, 11·50, and 9·66), the result is—

Mains in Exeter	£2142
,, St. Thomas	312
,, Heavitree	262
Total net rateable value in Exeter (£2142 *plus* £255)	2397
,, ,, St. Thomas (£3200 *plus* £312)	3512
,, ,, Heavitree.	262

For these figures, so far as Exeter and St. Thomas are concerned, I therefore give judgment. With regard to costs, the offer of the Exeter Assessment Committee was not far out (£2505); but, taking into consideration that Exeter has admittedly been receiving too much for some years, the appeal must be allowed, with costs; and I make the same order in the appeal against St. Thomas. In allowing the costs to the appellants, I have also been influenced by the consciousness that such errors as I must have committed in this calculation (because it is impossible to do this thing with scientific accuracy) are rather against the Gas Company than in their favour; and I am sure I have allowed the full value of their concern.

Mr. HAWKE, on behalf of the Company, said the rates had been paid under protest; and he asked for an order that the surplus might be returned.

The RECORDER said he was not sure that he had authority to make such an order. He had always considered that rates paid under such circumstances were paid on the understanding that any surplus was to be returned on appeal.

Mr. HAWKE assured the Recorder that he had the power, and he cited authority. He expressed his willingness to accept from the other side an undertaking to pay.

Mr. RANDOLPH, who was present for the Exeter Assessment Committee, assented to the payment so far as the Committee were concerned, but said he could not do so for the Overseers, who were not represented. It would therefore be necessary for the Recorder to issue an order.

Mr. DUMMETT, on behalf of the St. Thomas Assessment Committee, said his clients instructed him to say they were quite ready to pay over to the Company any excess of rating.

The order asked for was made.

The Case of Embezzlement at Longton.

At the Staffordshire Assizes last Saturday, Mr. Joseph Speakman, who had since 1899 occupied the position of Secretary and Cashier to the Longton Corporation Gas Committee, pleaded guilty to charges of embezzlement. The facts of the case were given in the "JOURNAL" for the 5th inst. (p. 49). On behalf of the prisoner, it was stated that, although the whole of the money (more than £4000) had been squandered in betting, he had never had a penny from the bookmaker, though he had backed some winners. The Judge (Mr. Justice Bucknill) demanded that the name of the bookmaker in question should be given publicly; and this having been done, he said he had never heard of a man squandering such a sum in betting without getting any return. Before saying anything further, however, he would have inquiries made. He sentenced the prisoner to eighteen months' hard labour.

Contractor's Liability for a Defective Reservoir.

At Teignmouth, last Tuesday, the hearing was commenced, before Mr. Edward Pollock, K.C., the Official Referee of the High Court of Justice, of an action in which the Teignmouth Urban District Council claimed of Mr. Arthur Henry Slocombe £2509, damages for breach of contract in connection with the construction of the Hazeldown reservoir. Mr. C. A. Russell, K.C., and Mr. A. A. Hudson appeared for the Council; while Mr. A. Clavell Salter, K.C., and Mr. J. B. Matthews, represented Mr. Slocombe. It was alleged by the plaintiffs that the defendant had used inferior concrete, and practically disregarded the specifications, with the result that the reservoir was useless as a water-tight piece of work. On the other hand, it was argued that the deviations from the original specifications were ordered, and permitted by the Surveyor at that time, and that he and the Clerk of Works were cognizant of all that was done. The hearing occupied four days. In the result, the Referee ruled against the defendant on every point; and remarked that the clause in the contract bound a contractor to fulfil his obligations. Judgment was given for the plaintiffs for £2000, with costs. A stay of execution was granted pending an appeal, on the defendant paying into Court, or giving satisfactory security for, the amount named.

Liability for Damage to a Lamp-Post.

In the Crewe County Court, last Wednesday week, the Town Council sued a local coal merchant named Joseph Simon to recover £3 3s. 10d. for damages to a lamp-column caused by his lorry. The Town Clerk (Mr. F. Cooke) explained that on March 1 a man named Cannon, then in the defendant's employ as a carter, was proceeding with a lorry laden with bags of coal. When he reached Chester Bridge, Cannon trotted the horse up the slope at a hard pace, with the result that when the horse reached the top of the bridge he was unable to stop it. The animal dashed down the bridge, and into High Street; and after swerving about, the front of the lorry crashed into a lamp-post and smashed it at the base. He urged that Cannon had not proper control over the horse, and that the damage done was entirely due to his negligence. For the defence, it was stated that the affair was a pure accident. Cannon gave evidence to the effect that the horse was a young animal, and had only been in the defendant's possession for about three days. He gave the horse a "trot" up the bridge; and when about ten yards from the top it began to gallop, and he lost control of it. He stuck to its head until he was thrown down. His Honour Judge Reginald Brown, K.C., remarked that Cannon had himself admitted that the horse went at full gallop up the bridge. It was a driver's duty to have better control over his horse, and to stop it at the top of a bank before commencing the descent, in order to apply the brake. He had not the slightest doubt in giving a verdict for the plaintiffs, with costs.

Manager's Claim against a Gas Company.

At the Huddersfield County Court, a few days ago, his Honour Judge Cadman had before him an action brought by Richard Henry Whiteley, of Mold Green, against the Kirkburton Gas Company, Limited, for £12 17s. paid by him for work done while he was their Manager. He stated that, acting under the orders of the then Chairman, he had had certain things done at the house in which he was to live, plumbing at consumers' houses, repairs to retorts, &c., which it was not his duty to do. He explained that he did not ask for payment of the accounts when he was paid his last wages, because there were grumblings about the bills that went in; and he sent in the accounts after his dismissal. The defence was that the work for which the plaintiff claimed the £12 17s. it was his duty to do as Manager; and he had no authority to get others to do it and pay them. Bills for outside work had to be laid before the Directors and passed by them before being paid. His Honour said that, looking at the area of the Company's supply, which was 12 miles, and the evidence, he thought all the work was done for the Company, and that the plaintiff had authority committed to him to employ outsiders to do it. The only folly about the whole thing was that the plaintiff did not at once bring the matter before the Directors. If he had done this, there never would have been any necessity for the case. He struck off certain parts of the claim, as to papering and painting at the house, and gave a verdict for the plaintiff for £12 13s. 3d. and Court costs only, as the proceedings had been brought about through the plaintiff's own folly.

MISCELLANEOUS NEWS.

RICKMANSWORTH GAS ARBITRATION AWARD.

The award in the Rickmansworth arbitration respecting the purchase of the undertaking of the local Gas Company has been presented, and has been taken up by the Council. The amount is £26,950, *plus* the mortgage debt of £3933. The arbitration proceedings, it will be remembered, occupied two days last April. The Umpire was Sir George Livesey; and the Arbitrators, Mr. H. E. Jones for the District Council and Mr. Joseph Hepworth for the Company. Deducting the mortgage debt previously referred to, Mr. Corbet Woodall's valuation for the Company worked out to £37,214; but the total amount asked for by Mr. Wedderburn, K.C., in his closing address was £33,440. Mr. F. H. Jones (of the firm of Messrs. H. E. Jones and Son), for the Council, placed the value of the works at £17,936.

The Company, we believe it may be stated, are well-satisfied with the award. But why they should be may not be altogether clear to anyone who has not followed the history of the Company during the past two years or so, and who may only look at the amount of the award in the light of the present balance-sheet. What is meant here will be seen at once when it is stated that the purchase clause was inserted in the Company's Act of 1902; and at the time of the passing of the Act the capital stood at £15,700, divided into £10,700 of 10 per cent. capital and £5000 of 7 per cent. By the same Act, this capital was converted and consolidated into £28,000 of 5 per cent. stock. As stated, the award is £26,950. There is also a mortgage debt of £3933, and an overdraft at the bankers of £4450 on capital account. For both these, the Council are responsible. Beyond these many thousands, there are the expenses of the Company's Act of 1902 (which, it is believed, amount to £2332), the cost of the Council's opposition to the Bill, the expenses attaching to their own application to Parliament in 1903, and the costs of the arbitration. These expenses totalled will not represent a light sum. Upon this, it will be necessary, it seems, to provide a respectable sum for extensions. Looking at the matter how one will, the opinion will keep uppermost that the Council are taking on to their shoulders a heavy responsibility. But at the same time, if the purchase is consummated, we hope that success will attend the undertaking, and that the consumers will not suffer from the anxiety of the Council to secure its possession. According to the Act, the purchase money has to be paid within five months, or the whole business will be at an end. In that event, the Council will still have to pay the costs incurred, and compensate the Company for the trouble to which they have been put. So that all interest in Rickmansworth does not cease with the issue of the award.

Midsomer Norton Water Supply.—An interesting function took place at Downside, Midsomer Norton, on the 14th inst., when, on one of the principal heights of the Mendip Hills, known as Stock Hill, a large scheme of water supply promoted by the Downside Abbey authorities was inaugurated. The first sod was turned by the Very Rev. Father Leo Almond, the Prior of Downside College. In the scheme is included the construction of a reservoir 82 feet long, 49 feet broad, and 16 feet deep, to contain 400,000 gallons of water. The roof will be supported on cast-iron columns, with rolled sheet joists and cement concrete arches. The motive power for pumping the water will be two Crossley gas-engines, each of 19-horse power. The pumps will be capable of delivering 300 gallons per minute. The Rev. F. P. Whiteside, of Downside Abbey, has designed the reservoir pumping plant and station, while Mr. W. F. Bird, of Midsomer Norton, is the Engineer responsible for carrying into effect the remainder of the scheme—viz., supplying the parishes of Binegar, Ashwick, Gurney Slade, Emborrow, Midsomer Norton, Chilcompton, Farrington Gurney, and Paulton.

THE COMMITTEE ON METROPOLITAN GAS TESTING.

ABSTRACT OF THE EVIDENCE.

Fifteenth Day.—Monday, May 2.

Mr. Henry A. Harben.

The proceedings to-day were opened by the calling of Mr. Henry A. Harben, the Chairman of the Public Control Committee of the London County Council, who was examined as to the suggestion that penalties should be assessed by the Chief Gas Examiner, rather than that the matter should be taken to a Police Court. Witness said, as regarded the ability of the Magistrate to assess proper penalties, that this, of course, was a matter with which his Committee were not familiar, but which would be better understood by chemists. The County Council were rather concerned with the question of policy; and they attached a great deal of importance to the publicity which was secured by proceedings before a Police Magistrate. His Committee would therefore be averse to any change which would diminish this publicity. They did not wish that the Companies should be submitted to any indignity; but it hardly appeared to his Committee, from the information before them, that this was at present the case, or that the Companies were in a different position to a large number of other people who went before a Magistrate and did not incur the stigma of being criminal. His Committee understood that in those cases in which the Chief Examiner was of opinion that the defect was not due to a preventible cause, the Company never went to a Police Court; so that the only cases in which they did do so were those in which, from negligence or otherwise, they had failed to supply the public with the article to which they were entitled.

The Chairman pointed out that there was another view of the matter. What the Companies, he thought, really felt as much as anything was, in the first instance, the place to which they were summoned; and, secondly, the use made of the situation by a section of the Press advertising them with flaming headlines as selling bad or impure gas, or something of that kind, whereas the excess of impurity might be very trivial. Witness replied that this was no doubt unfortunate. But everyone was more or less subject to the vagaries of the Press; and the Companies were in no worse position than any tradesman who had committed a trifling offence against the Food and Drugs Act. Possibly in a certain number of cases at all events the offence was not at all suitable to be treated at a Police Court; but at the same time the Gas Companies were not at all peculiar in this respect. His Committee were advised that, in the case of an accidental occurrence, the matter never went to the Police Court, but that the Chief Examiner cancelled the report of the gas examiner. They could not help feeling that the knowledge that the proceedings would be public must act more or less as a stimulus to the Companies to do their best. Their view, in fact, was that the publicity was the main part of the penalty. He thought, however, the Council would be content if only those cases were taken before a Police Court in which, in the opinion of the Chief Examiner, there was distinct negligence, and which were really substantial. But even in this event, they would desire that some sort of publicity should be given to the reports of the Chief Examiner. He agreed with Mr. Moulton that, in a manufacture which had to go on night and day all the year round, and in which there were impurities very difficult to take out, it was rather hard that a failure which might be a very slight one should take the parties to a Police Court.

The Chairman suggested that there would be no difficulty in securing the desired publicity. For instance, it might be prescribed that the Chief Examiner should make a report to the Board of Trade to be presented to Parliament. He asked witness whether such a quarterly return to Parliament would meet his views; and witness promptly replied: "Nobody reads that." He, however, quickly corrected himself, by adding: "I mean no one of whom the Gas Companies would be, I suppose, in the least afraid." He went on to say that the Council had no vindictive feeling towards the Companies at all. They only wished to protect the public from every kind of deficiency in the illuminating power of the gas. He did not know of any way by which penalties could be recovered, entailing a certain amount of publicity, otherwise than by going to a Police Court. If it were decided that only defaults which were substantial, and due to negligent conduct of the works, were to be taken to the Police Court, he thought it would be desirable that the Council or their Chemist should have the opportunity of taking them to the Police Court if they thought proper. It might be that a practice would grow up of not sending them to a Magistrate.

Mr. C. Vernon Boys, recalled.

Mr. Boys, on being recalled for further examination, was asked by the Chairman whether he had noticed that in the evidence there was a discrepancy as to the relative heating power of the various gases supplied in London. Whereas several witnesses rated rather highly the heating power of the Gaslight and Coke Company's gas containing a proportion of carburetted water gas, his (witness's) estimate was lower. Witness said this was true, and it resulted from the fact that the figures he gave were from memory alone. On looking through his notes, he found there was a single observation only of 145 calories per cubic foot for the Gaslight and Coke Company; and this particular one had remained in his mind. The average, however, was well above that. He stated at the time that he was only speaking from recollection. Having since received a request from the Secretary to the Committee to make some examination of the calorific power of gas, he had done so; and as a result, he could say that the low value which he attributed to the Gaslight and Coke Company's mixture of coal gas and carburetted water gas was not fair to the Company.

After explaining that all through he had taken only the gross figures, witness proceeded to give the results of his later tests. Beginning at the Stoney Lane testing-place of the South Metropolitan Gas Company, he found the mean of four determinations (corrected for temperature and pressure) to be 610·4 B.T.U. per cubic foot. The illuminating power immediately before was 14·65 candles; and during the day there had been only a trifling variation. He next went to the Wellclose Square station of the Commercial Company. There the calorific power changed rather more; the average over half an hour being 616·2 B.T.U. The illuminating power had varied during the day between 13·73 candles in the morning and 16 candles in the afternoon; falling to 15·22 candles immediately before the calorific test, and rising to 15·76 candles directly after it. There was a rising calorific value during the half-hour from 610·4 B.T.U. at the start to 619·2 B.T.U. in the middle, and falling to 617·5 B.T.U. at the end. These variations were a good deal more than the limits of experimental error. Subsequently he visited Spring Gardens, and got on to the 48-inch main of the Gaslight and Coke Company from Beckton. The mean calorific value there was 616·2 B.T.U. per cubic foot, or identically the same as he had previously found for the Commercial Company's gas at Wellclose Square. The illuminating power was low—15·51 candles just before the calorific examination, and 15·86 candles directly afterwards. In point of fact, therefore, both the lighting power and the calorific value of the two last-named gases were much the same, irrespective of the difference in the illuminating power requirement. Both were enriched by means of carburetted water gas; and though the Commercial Company's consumers were only entitled to 14-candle gas, as measured by the new method, they were really getting 16 candles, and occasionally more.

Mr. Moulton was anxious to know (in view of the changes in illuminating power shown in the case of the Commercial Company's gas) whether the diffusion of the enriching gas through the other was very rapid; and witness said he did not think diffusion in a holder occurred at all. Mr. King remarked that he could give the Committee definite information on this point from his own experience. If they took the two streams passing through two meters in equal bulk—50 per cent. of carburetted water gas and 50 per cent. of coal gas—and allowed the two outlet pipes to impinge on each other and proceed in one main to the holder; and then if they took a sample of gas within five or six yards of the meter, again in the holder, and again on the district supplied from that holder—there was a wonderful uniformity of result. There was no stratification apparently in the holder, the mains, or the inlet pipe. Mr. Moulton: "Do you find stratification if you let the two gases come into the holder by different mains?" Mr. King: "I have only one inlet." Witness: "I would answer that question theoretically only. The two gases separate by their density and on account of diffusion acting in such an excessively minute degree when the dimensions are big enough; there is the same kind of difference with conductivity of heat on a big scale. At least, minutes become years; and the diffusion which in a laboratory is perfect in an hour or two, I suppose, would require a month or two with dimensions such as those of a holder. If you blow into a holder one gas, and later on blow into it another gas, even from the same inlet, if the gas you blow in afterwards is of a lighter kind it will get to the top; if it is heavier, it will remain at the bottom. It will certainly accomplish its purpose. I do not think that gas sent into a holder first of one quality, and then of another will be mixed in the holder; the heavier gas will remain at the bottom for a very long time." Witness added that he did not say the gases sent into the holder were necessarily sent in *seriatim*. They probably were (as Mr. King had arranged at his works) sent in together. If this were done, and they were mixed first in proper proportions, as Mr. King had explained, there would be a uniformity of composition, for, of course, the gas would never unmix.

In reply to a remark by Sir William Abney, to the effect that the figures he had given were remarkable ones, witness said he was sorry that the variation of illuminating power was not greater. Looking over some earlier observations that had been made in the South Metropolitan district, he found that the calorific value and the illuminating power, if the former was expressed in calories to the cubic foot, varied in this way: The calorific value was always, one might say, exactly ten times the illuminating power; and this was rather a convenient reason for adhering to calories to the foot, instead of British thermal units. There were also, of course, other practical reasons for doing so. Some other tests made of the Gaslight and Coke Company's gas showed it to have a value of between 154 and 156 calories per cubic foot. In British thermal units, the four figures obtained in the tests he had first referred to of the Gaslight and Coke Company's gas (when the mean calorific value was 616·2 B.T.U., and the gas was of a low illuminating power) were 617, 617·8, 615, and 615. Sir William Abney: "It seems from this that with the South Metropolitan Company the calories per candle are greater than with the Gaslight and Coke Company?" Witness: "I have not converted that. I should think they would be."

In conclusion, witness was asked some questions with regard to the properties of carburetted water gas. He said that its calorific value depended entirely on the amount of enriching oil gas present; and whether it would increase or decrease the calorific value of coal gas, would be decided by the proportion of carbonic acid it contained. Carbonic acid, if present, lowered the illuminating power very much; and so if the gas was of a given illuminating power, it would have so much more enriching and therefore highly calorific material present to obtain the illuminating power. The calorific value of the gas would be the more for a given illuminating power the greater the amount of carbonic acid present. He believed that this was a possible cause of trouble and discrepancy. The Chairman remarked that it had been put before the Committee on behalf of the Gaslight and Coke Company that the extra candle power put into the gas by enriching it gave advantages from the heating point of view. Witness said that, looking over some old observations, he found the calorific value was very nearly in proportion to the illuminating power in the case of the South Metropolitan gas. That was to say, with the small variation of about 1 candle between 14½ and 15½ candles, the calorific value (measured in calories) was always almost exactly ten times the illuminating power; so that 14½-candle gas was 145 calories to the cubic foot, and 15½-candle gas 155 calories. This was coal gas possibly slightly enriched with benzol—he could not say how it was enriched. Mr. Moulton: "Carburetted water gas is by no means a definite substance; they could vary it so immensely by carburetting?" Witness: "Yes; it depends how much carburetting is done."

MUNICIPAL AFFAIRS AT BRADFORD.

The Question of Profits.—Cheaper Gas.

A Special Meeting of the Bradford City Council was held last Wednesday, for the purpose of considering the estimates for the current financial year.

The Chairman of the Finance and General Purposes Committee (Alderman J. A. Godwin), in the course of his statement, again alluded to the question of profits from municipal trading departments, to which reference was made at the previous meeting of the Council (*ante*, p. 210). In considering how to provide the additional sum needed for the coming year (£23,098), he pointed out the enormous temptation which beset the man at the head of a city's financial affairs—for the sake of his Party, for the sake of his own reputation, even with a tender consideration for the ratepayers—to keep down the rates by hook or by crook. There were, he said, many methods. Liabilities might be carried forward in suspense—this had been done in Bradford—or what ought by right to be charged to revenue might be placed to capital account. Then unearned profits might be anticipated—this had been done elsewhere. But the greatest temptation of all was appropriating profits from trading departments. He had frequently ventured his opinion on this latter point. It was perfectly legal; and in some small degree, it was perfectly right. In such trading departments as tramways and electricity, there would have to be a very large and consistent surplusage of receipts over expenses to allow an appreciable reduction to the customer. But he, and those with whom he was asscciated, did hold most clearly that it was wrong to make large profits with the distinct object of relieving the ratepayers. The responsibility of coming to a decision he had felt to be very great. He had also been sorely tempted to finger some of the alluring profits lying ready to his hand. He preferred, however, to stick to the principles which his Party had laid down so distinctly, and which had received the approval of the ratepayers. If the ratepayers had thought better of it, and preferred to pay a share of the cost of municipal institutions by enhanced prices of municipal commodities, rather than through the rates, the remedy lay in their own hands; and they could summon to the Town Hall another set of managers who would return to the old *régime*. So short a time ago as 1902, £10,700 was taken out of dubious gas profits in relief of the rates. When, however, he presented his first estimates, for 1903, he took nothing from profits; and the same plan was followed last year. This year also he intended to take nothing from trading profits, though they existed. He proposed to meet the increased demands by a small advance of 2d. in the pound on the rates.

Referring to the water-works, Alderman Godwin remarked that gloomy prophecies had been made from time to time by pessimistic critics as to the serious increase of rates which would have to be imposed to meet the deficiencies on this account. It was therefore pleasing to be able to record that during the past year, in spite of very perceptible effects of the local trade depression, a net surplus of £6865 had been made, after payment in respect of interest on loans of £101,813, and providing for liquidation of debt to the extent of £22,940. The accumulated surplus at the close of the preceding financial year was £13,734, to which was added a surplus of £6865 on the past year's working; making a total credit balance of £20,599. This result had been attained after bearing interest on loans upon the Nidd expenditure during the period of construction, and while no income was derivable therefrom. The interest on this part of the undertaking from the commencement to March 31 last represented no less a sum than £199,588, together with £16,666 contributed to sinking fund before the suspension of such contributions was granted by Parliament. In view of this satisfactory position, and the steadily increasing income from the sale of water, no rate-in-aid would be necessary for the current year, notwithstanding the obligation to provide sinking fund in respect of the Nidd undertaking. If it was found the next or following year that the burden upon revenue was not met by the income, then the only practical and sound method of dealing with the question would be to charge the consumer what the cost demanded.

If, however, the success of municipal trading was to be measured from the financial point of view, said Alderman Godwin, then the Gas Department probably afforded the most striking vindication of the policy; for since the works were purchased by the Corporation in 1871, not only had the charges been considerably lower than those imposed by companies of corresponding size, but net profits had been made to the extent of £501,462, in addition to the formation of a sinking fund by revenue contributions of £233,309. Also for the larger part of the period the undertaking had borne the entire burden of street lighting, at a cost of some £450,000. The gross profit for the past year had been £71,927, out of which there had been paid for interest on loans the sum of £37,742. The sinking fund contribution had amounted to £24,269, leaving a net surplus of £9916. The capital expenditure on the works to March 31 was £1,125,513; the gross profit upon which sum was equal to 6·4 per cent. Among a list of eighty towns, the net price of gas averaged 2s. 6d. per 1000 cubic feet, as compared with about 2s. 1d. in Bradford; and this difference of 5d. would be equivalent to an additional profit of some £35,000 to £40,000. In 1902, the Council decided to devote a sum of £21,000 towards street lighting by gas; and in consideration of this, there was a reduction in the price of gas of 3d. per 1000 cubic feet, which was the monetary equivalent of the £21,000—making the ratepayers, who all shared in the benefit of street lighting, pay for the advantage, and removing the burden from the consumer. This £21,000 did not represent the entire charge to the gas fund; but it was a prudent step in the right direction, and a practical acknowledgment of the principle. At the Council meeting last June, the Gas Committee passed a resolution to the effect that, subject to the Finance and General Purposes Committee contributing an additional sum of £5000 towards the cost of street lighting, the price of gas would be reduced 2d. per 1000 cubic feet as from July 1. This meant that they would give the gas consumers £14,000 and charge the ratepayers some £11,000, or a saving to the inhabitants at large of £3000, without discounts. Even this would not quite, though it would approximately, represent the entire cost of street lighting by gas. He had thought it prudent not to make the change too sudden; but the principle involved would not be thoroughly carried out until the whole cost of street lighting, not only by gas, but by electricity, was borne, as it ought to be, by the ratepayers, instead of by the customers of a municipal monopoly. Last year he stated that the condition of the gas fund reserve largely depended upon the success of the Bradford Exhibition; and that, while hoping the £15,000 loan might be repaid in full, there was, of course, the possibility of making a bad debt. The exhibition had, however, so far proved a remarkable success; and at the present time the Committee in charge of it were in a position to repay all borrowed money.

In conclusion, Alderman Godwin said he did not wish to introduce debatable, still less political, questions; but he did want to refer to a policy—a policy which was clearly laid down, and which the ratepayers had unmistakably endorsed—and this was, that the consumer of a municipal monopoly should not be taxed to relieve the ratepayer. The Liberal majority had loyally carried out this policy. It, of course, accounted in some degree for a higher rate, though there were other factors to take into account. Was the city better or worse off as the result? Were its finances on a sounder basis than three years ago? During the whole of these three years, they had not touched one penny of profits in relief of rates. They had paid off a debt hanging over the Tramways Department, and also completed the purchase money of the old lines and kept the system in perfect up-to-date repair; they had added largely to the electricity depreciation account; they had converted a deficit of £8678 in the gas profit account to a balance in hand of £5756; and they added £15,429 to the water fund. In fact, taking the trading departments as a whole, they stood nearly £68,000 better than they did three years ago. Added to this, they had wiped off arrears in the provision for costs of Parliamentary Bills and oppositions. He might therefore claim that, at the end of the three years, they were leaving the city finances in a thoroughly satisfactory and sound state—nay, more, in a vastly better condition than that in which they were at the commencement of the term. It was a question for the ratepayers; and they must decide whether they should continue to approve of the policy, and whether what had been accomplished was an adequate return for the additional burden placed upon them.

During the discussion which followed the motion for the approval of the estimates, Mr. Dobson pointed out that in June he brought before the Council the question of the unfair treatment of the people of Thornbury and Tyersal, who, being within the area of the Pudsey Gas Company, were still paying 2s. 6d. per 1000 cubic feet for their gas. Now they would have to pay £650 a year more in rates without any compensatory advantage. Alderman Godwin said he fully recognized the hardship of the position of the people of Tyersal and Thornbury; but the Council's legal advisers informed him that parliamentary powers would be required in order to grant them any relief. The proper time to raise the question would be when next a Bill was being promoted. Mr. Jowett thought the Corporation should be building up a fund to deal with their liabilities, and also to give them a better standing in the commercial world. The burden of interest had been caused by national expenditure. Alderman Godwin's speech was quite correct as far as it went; but there were certain elements left out which ought to be seriously considered by the Corporation. The week before he had showed that upon their last financial year they had to bear a burden of 39·41d. in the pound for interest. To this had to be added the amount of interest borne by the Education Department, totalling to 3·27d.; and there was also the Guardians' debt, amounting to ¼d. in the pound. These items showed that the Corporation paid nearly half of their rates for the loan of money. How was this to be stopped? He believed that, instead of dissipating the whole of their profits every year, whether by giving them in relief of rates or to consumers by means of smaller prices, they should build up such a fund as he had suggested. Mr. Dobson said the principle of utilizing the gas profits was wrong. The Corporation were taking £5000 out of the rates, and reducing the price of gas 2d. per 1000 cubic feet, which would give no relief to Thornbury. The Thornbury people had been paying the increased charge for street lighting; but they had no benefit as to the cost of ordinary gas consumption.

Mr. Dobson moved an amendment that the price of gas should remain as at present, but subsequently withdrew it. Mr. Swithenbank then moved that the gas profits (if any) should be handed over to the Finance Committee, in place of adding 2d. to the rates; but this was defeated. Mr. Jowett next moved that the estimates should be adopted, with the exception of the portion relating to the price of gas, which should be referred back. Alderman Hind (the Chairman of the Gas Committee), however, said he thought the profits of the Committee would probably be larger next year; and this amendment also was withdrawn. The estimates were then passed.

ELECTRIC LIGHTING IN DUBLIN.

More Money Wanted.

A Local Government Board inquiry was held in the Dublin City Hall last Thursday, by Mr. P. C. Cowan, the Chief Engineering Inspector to the Board, to consider, among other things, an application by the Corporation for an additional loan of £21,000, to meet extra expenditure on the generating plant at the Pigeon House electric light station. There were several objections lodged against the granting of the loan, among them being one which set out the following: "(1) The plant is not now required by the Corporation, though it may be by the contractors to assist them in remedying defects under their existing contracts; (2) the City Council only authorized an application for £19,227 as the cost of the proposed new plant, and there is no authority to apply for the extra £1773 included in the sum of £21,000; (3) the proposed new plant is supposed to be destined at some future period to form part of an extension of the existing electricity supply undertaking, but the full cost of such extension is not disclosed." The Town Clerk was about to give evidence as to the report of the Electric Lighting Committee and the proceedings of the Council in connection with the loan, when Mr. Rynd, on behalf of the objectors, asked if the

amount of the loan was specified in the report, and elicited the information that it was not. The report embodied the scheme which went before the Council, who delegated full authority to the Lighting Committee. It was perfectly plain that a loan was contemplated by the Council, and it was left to the Committee to say what the amount would be. Mr. Burke (the Assistant Law Agent to the Corporation) said that what the Council really required was an inquiry into a proposal, which might necessitate formal application for a loan afterwards. The Inspector pointed out that the Corporation were seeking for a loan before they had decided that it was really required. Counsel insisted that the application was irregularly brought, and the Inspector decided in his favour; holding that it would have to be re-advertised and the preliminary expenses incurred all over again. Of the £21,000, it was stated that £19,227 10s. was required for new generating plant; the remainder being made up of fees, costs of inspecting the present plant which did not pass the running tests, and other incidental matters.

INCANDESCENT GAS LIGHTING IN LONDON.

At a Meeting of the Shoreditch Borough Council last Tuesday, the Lighting Committee reported that they had had under consideration the question of improving the lighting of the side streets. They had tested several systems, the most satisfactory of which appeared to be the Anti-Vibration Incandescent Gas-Lamp. The Committee instructed the Lighting Engineer (Mr. C. H. Doughty) to prepare a statement as to the cost of providing these lamps all over the borough; and it showed that the cost would be approximately as follows: Supplying and fixing 405 lamps with two burners and mantles in 110 wide streets, £1022 12s. 6d.; supplying and fixing 609 lamps with one burner and mantle in 202 narrow streets, £994 14s. The best of the lamps displaced from the other streets could be altered and fitted with one burner and mantle at a cost of 10s. each, and fixed in various courts and alleys at a total cost of £22 10s. It was estimated that the annual cost for gas, maintenance of mantles, lighting, extinguishing, painting, and cleaning would not exceed the present cost; while the increased illumination would be very great. The scheme sketched in the report was adopted; and it was resolved that the work should spread over two years. The Stores Committee of the Bethnal Green Borough Council reported on Tuesday that they had considered tenders from various firms for street gas-lamps, incandescent fittings, &c., and that of Messrs. S. Pontifex and Co. had been accepted, subject to the usual sanction, at the following prices; 120 street-lamps, 17s. 6d. and 16s. 10d. each; frog and ladder irons, 3s. 6d.; No. 4 Kern burners complete, 7s. 8d.; extra for name slip bars fixed, 2d.; removing existing lanterns, 1s. 9d.

TREATMENT FOR MOND GAS POISONING.

The following is the notice issued by the Castner Kellner Alkali Company for the prevention of Mond gas poisoning, referred to in our "Editorial Note" on the report of the Chief Inspector of Factories and Workshops for the past year.

Caution.—Breathing of Mond gas should be avoided as far as possible. It is dangerous when breathed in large quantities.

Symptoms.—The first symptoms produced by breathing the gas are giddiness, weakness in the legs, and palpitation of the heart. If a man should feel these symptoms, he should at once move into fresh warm air, when in slight cases they quickly disappear. Exposure to cold should be avoided, as it aggravates the symptoms. A man should not walk home too soon after recovery, as muscular exertion is to be avoided.

Medical Aid.—If a man should be found insensible or seriously affected by the gas, he should at once be moved into fresh warm air, and the oxygen administrator at the Mond plant immediately informed. A medical man should be sent for at once. If the man breathes regularly, though insensible, the oxygen should be administered with the face-piece provided, simply holding it over his mouth and nose, and keeping the bag full of oxygen. If apparently no longer breathing, or if breathing very feebly, either (*a*) artificial respiration will be necessary, using the face-piece over the mouth and nose, or (*b*) the rubber tubing with a small metal tube placed between the teeth can be used. In this case, by closing the mouth and nostrils, and using the oxygen with a little pressure on from the cylinder, the lungs can be inflated; the used-up oxygen should be pressed out of the lungs every five or six seconds.

Repairs.—No man should work alone on any work which necessitates exposure to the gas.

Night Work.—On any occasion when the plant is required to work through the night, the watchman should visit the plant on each round and his call should be answered.

Accrington Gas and Water Board.—The annual report of this Board shows that the cotton-mills used 7,668,000 cubic feet less gas in the past financial year, because of incandescent and electric lighting and depression in trade. The total production of gas amounted to 388,376,000 cubic feet—an increase of 13,397,000 cubic feet, or 3½ per cent. The receipts for gas amounted to £48,379, a rise of £1888, or three times the increase of 1903 over 1902. The gross profits amounted to £24,943, or £7142 more than for 1902-3. The water consumed amounted to 518,165,000 gallons. The revenue from its sale was £21,093, an increase of £207. The gross profits amounted to £14,208, or £558 less than before. Owing to subsidence, considerable damage was done during the year to the filter-beds at Mitchell's reservoirs; and the work is now suspended.

VENTILATION OF "GASSING" ROOMS IN MILLS.

The annual report of Dr. Whitelegge, the Chief Inspector of Factories, which, as mentioned elsewhere, has just been issued, contains a report by the Superintending Inspector of Factories (Mr. H. P. Smith), in the course of which he makes the following remarks on the above subject.

In cotton, silk, and woollen mills, the process of "gassing" is carried on; the yarn being passed through gas-flames to burn off the projecting fibres. On an average, there are perhaps 10 "gassing" frames in each room, with 130 burners on each frame. With 1300 jets burning at the same time, as might be expected, the rooms are exceedingly hot; the air is vitiated not only by the ordinary products of combustion, but also by expired air, smoke, and fine dust.

Generally speaking there is ample cubic capacity, and with rare exceptions mechanical ventilation of some sort is found. Sufficient attention to detail, however, is wanting; rendering the air impure and unwholesome at the level where it is breathed by the workers. Claims were made by makers of certain burners that, by securing more perfect combustion, atmospheric conditions would be greatly improved. In order to test the accuracy of these statements, I collected samples of burners, which were submitted to Dr. Thorpe, Principal of the Government Laboratory. Owing to the absence of conditions similar to those found in the gassing-rooms, it was impossible for Dr. Thorpe to analyze the products of combustion from all the burners submitted; but he says in regard to those not examined, "there is no reason to suppose that the products of combustion from these burners, whether (1) with gas only or (2) with a mixture of gas and air, would differ substantially from the corresponding products given in these two cases respectively by the burners which have been examined." He further points out that the amount of carbonic acid produced by the combustion of a given quantity of coal gas depends almost entirely upon the composition of the gas and practically not at all upon the burners. His examination was therefore confined to the two substances—carbon monoxide and acetylene—which are specially deleterious to health, and the amounts of which depend upon the efficiency of the burner in producing complete combustion of coal gas. Minute quantities of carbon monoxide were found in all cases, the results being as given in Table A.

TABLE A.

Burner.	Flame.	Fed with.	Acetylene.	Volume of Carbon Monoxide yielded for each Cubic Foot of Gas Consumed.
1	Two row	Gas and air	Nil	0·00035 cubic foot
2	,, ,, ...	Gas only .	,,	0·00050 ,, ,,
3	Three row	,, ,, .	,,	0·00060 ,, ,,
4	Three row, one flame	Gas and air	,,	0·00045 ,, ,,
5	Single flame . . .	,, ,,	,,	0·00055 ,, ,,
6	Two row, luminous .	,, ,,	,,	0·00063 ,, ,,

No. 6 burner was constructed upon the atmospheric principle for consuming gas and air; but, except when burnt very low, the flame was luminous—showing that the mechanical arrangements were not such as to admit the air in proper proportion. Dr. Thorpe points out (1) that the amount of carbon monoxide given off in a unit of time will depend upon the rate of consumption of the gas; (2) that while some burners have only a single flame, others have two or three, and many perhaps in practice do the work of two or three single-flame burners; and (3) that in the case more particularly of burners using gas only, the result will depend to some extent upon the size of the flame employed. Without precise knowledge of all the conditions under which the burners are used, it is not possible to select any one as being markedly superior to the rest; but, on general grounds, it may be said that burners of atmospheric type, consuming a mixture of gas and air, and giving a non-luminous flame, are much more likely to be satisfactory than those burning gas only.

I noticed in the gassing-room of an important firm that, though ordinary gas was burnt in a non-luminous burner, the flame when the cotton was passing was pale blue, and when not passing yellow. The explanation given by the firm is as follows: "Ordinary coal gas is used of about 17-candle power, and the burners are of a special type which give fairly perfect combustion when in use. The burner shows a yellow flame when not in use, but when the material (cotton yarn) passes backwards and forwards through the flame, enough air is carried with it to practically convert the burner into an atmospheric burner."

Dr. Thorpe's experiments point to the fact that minute quantities of carbon monoxide are given off from each burner. Taking into consideration the large number of burners and their position in regard to the workers, I suggest for consideration whether these fumes are not in themselves a serious menace to health. Lecturing at Manchester on Jan. 13 last, on "Poisoning by Phosphorus, Sulphuretted Hydrogen, and Carbon Monoxide," Professor Oliver is reported to have said: "An atmosphere which contains 0·14 per cent. of carbon monoxide will transform half of the colouring matter of the blood into carboxy-haemoglobin." In Dr. Arlidge's work on "Diseases of Occupations," he says: "In some gassing-rooms the dust pervades the air sufficiently to produce a haze; and the casual visitor is cognizant not only of the smell of scorched organic matter and of unconsumed gas and gaseous products, but feels his breathing hurried and thickened, and his throat irritated and dried, giving rise to a sensation that ends in a cough." Dr. Arlidge satisfied himself that the workers sooner or later became short-breathed and bronchitic. His remarks apply alike to gassing in cotton-mills, silk-mills, woollen-mills, and lace making.

Assuming that the proportion of carbon dioxide in the air may be taken as an index—not an accurate measurement—of other impurities present, the tests which follow were taken in gassing-rooms in silk, cotton, and woollen mills. Those in Table B were collected by me and were analyzed by Mr. Williams; those in Table C were collected and

analyzed by Mr. Verney. The conclusions I arrive at are: (1) That it is clearly shown that by the use of suitable mechanical appliances it is not only possible, but easy, to secure in gassing-rooms an atmosphere conforming to a reasonable standard of carbonic acid, and you may hereafter consider the desirability of recommending such a standard. (2) That in many gassing-rooms the air is sufficiently impure to prejudice the health of the workers—this being due to want of, or defective systems of, ventilation.

I have visited many works and consulted many authorities with a view to forming opinions as to what systems of ventilation produce the best results. Cowls placed immediately over the gassing-frames with an exhaust current caused by fans would draw away all noxious fumes at the point of origin. Such a system is efficient in match-works, galvanizing works, for carrying off naphtha fumes in "spreading" rooms in india-rubber works, in some departments of dye-works, and many others. Writing to me on Jan. 26 last, Mr. Verney refers to "the vicious old system of removing impurities by first of all filling the air of a room with them, and then extracting that air by means of a fan." He sends a plan and description of a method he proposes for local exhaust which is well thought out, and quite worthy of consideration. Mr. Verney's views had been anticipated by me, but were objected to by manufacturers; but I am disposed to think that his plan, properly applied, and kept clean, would get over most of the difficulties suggested.

I wish to point out in general terms why poor results have been obtained after the expenditure of large sums of money. I attribute failure in nine cases out of ten to want of intelligent thought in the arrangement of inlet ventilation. Holes are made in walls (inside temperature at 90° Fahr., outside 32° Fahr.), and the result is a blast of cold air striking the worker. Ventilators, of course, are at once closed. A mixed system of plenum and exhaust ventilation is common. The inlet air is in no way diffused. It either strikes the workers in a cold blast, or is drawn across the room in a short circuit by the exhaust fans. If it is possible for the workers to do so, they at once stop such inlets; the result being that exhaust fans are running at heavy cost, doing harm rather than good. Another method of obtaining inlet air is to have openings under the frames which admit warm air from rooms underneath; but this air is not only warm but vitiated.

Well-intentioned means of admitting fresh air from outside are commonly found in the shape of air trunks under the frames; but the admitted air strikes the worker in the form of a cold draught, and she promptly stops up every aperture. The remedy is simple. Pass the air from outside through a radiator. The temperature can be regulated at will at a minimum of cost. I have in my mind works in which are found in two rooms no less than 11 Blackman 36-inch fans (750 revolutions), 23 36-inch fans of other types (560 revolutions), 15 wall ventilators, 311 openings in floors communicating with rooms below, 2 ventilators bringing air from outside, and various swing windows. It will readily be believed that occupiers who adopt such large precautions are not indifferent; but the results are not satisfactory. A few modifications to remedy the defects indicated would, without much expense, produce very different results.

In extensive works at Skipton, at the time of my visit, the atmosphere in the gassing-room was pure and comfortable. The inlet air was completely warmed by passing through the radiator, led by ducts under the frames, and allowed to escape in diffused form through controlling grids. I was much pleased in visiting a large woollen-mill near Bradford, to see in the gassing-room a system of ventilation which I believe to be conceived on sound principles. Under each frame there is an air-trunk, with openings sufficiently minute to prevent draughts or currents likely to interfere with the flames. Through these openings there is a powerful exhaust. Inlet air comes from the ceiling, so there is always a down-draught which prevents the diffusion of fumes in the room, and draws them away from the point where the workers breathe.

TABLE B.

Mill.	—	Carbon Dioxide in Parts per 10,000.
Cotton, No. 1 .	Small room—opposite side to fan . .	11·2
	,, near the fan	11·0
	Larger room	9·2
Silk, No. 2 . .	No. 1 room—Four samples taken in different parts of room	5·4, 7·8, 6·0, 7·6
	No. 2 room—Three samples taken in different parts of room	12·0, 11·6, 2·8
	On another day in same mill—	
	No. 1 room	11·6
	No. 2 room	12·0

TABLE C.

[Nos. 1 to 11, cotton-mills; Nos. 12 to 14, silk-mills.]

No.	Cubic Capacity of Room (roughly).	Gas-Jets.		Number of Work-People in Room.	Carbon Dioxide in Parts per 10,000.
		Total Number.	Number Lit at Visit.		
1	100,000	..	970	13	5·8, 6, 5·8, 5·3.
2	6,000	..	150	2	9·0 (worst position).
3	59,000	1700	1500	11	7·7, 8·3, outside 3·1.
4	117,000	2710	2592	..	7, 7·1, over lights 8.
5	11,500	280	140	4	No test.
6	39,000	960	360	4	9, 7·9.
7	100,000	3360	1280	12	8·9, 8.
8	55,000	2300	2300	17	6·3, 5·8, 6·3, outside 3·8.
9	18,000	..	700	5	7·7, 6·8.
10	8,280	396	396	4	12·8, 12.
11	21,000	810	810	8	12, 11·5.
12	5,400	124	62	2	16, 14·8, 14·1.
13	26,000	408	340	12	6·8, 6·8.
14	62,000	..	1074	32	8·2, 9·9, over lights 11·4.

Exhaust Fans.—(1) Three of 36 inches diameter and one of 24 inches diameter in roof. (2) No fans. Door and windows opened as wind permits. (3) Two 36-inch diameter and three 24-inch in roof. (4) Five 30-inch diameter in roof. (5) Three 22-inch in windows. (6) Four 30-inch in roof. (7) Four 30-inch, five 24-inch (of which two were stopped), two 40-inch (both stopped). (8) Five 30-inch in roof. (9) Six 30-inch in roof. (10) One 22-inch in window. (11) One 36-inch in roof. (12) One 12-inch in roof. (13) One 30-inch in end window. (14) Ten 24-inch in roof.

Air Inlets.—(1) Inlets in three walls, mostly communicating with other rooms. A perforated trunk under each frame communicating with outside. (2) No special inlets. (3) 27 perforated stones in walls (nearly all stopped up); 23 Tobin tubes (of which seven were shut); inlets under three of the frames. (4) 35 window inlets; 35 perforated stones in walls; 22 openings from room below gassing-room. (5) Inlet panes in opposite windows, but all were closed. (6) An inlet duct under each frame, communicating with open air. (7) 46 wall inlets; two plenum fans of about 40 inches diameter (stopped at time of visit), which, when running, feed ducts under the frames. (8) 11 window inlets; 15 inlet ducts under the frames, but three were shut. (9) Gratings below windows and inlet ducts under four (out of six) frames; partly closed. (10) Small window inlets, of which only two were open; four wall inlets, all closed. (11) 16 small inlets in windows, all except two or three shut. (12) Three small inlets stopped up. (13) Skylights open at end of room opposite to fan. (14) The special inlets are only opened in warm weather. The roof was far from being air-tight.

BIRMINGHAM CORPORATION WATER SUPPLY.

Inauguration of the Welsh Scheme.

The great scheme which has been in progress for upwards of ten years for bringing a supply of water from Wales to Birmingham, was formally inaugurated by their Majesties the King and Queen, with considerable ceremony, last Thursday. The inception and progress of the scheme have been duly recorded in our columns; but the following particulars will doubtless be read with interest in connection with an event which has been marked with Royal favour.

The increased demand for water resulting from the rapid growth of the population of Birmingham brought the Water Committee some years ago face to face with the great difficulty of meeting the requirements of the borough from the then existing sources. The local works were therefore increased; but still the demand rapidly overtook the supply. Eventually it was forced upon the Town Council that something would have to be done on a large scale if the wants of the inhabitants were to be adequately supplied. Accordingly, on Oct. 7, 1890, they passed a resolution instructing the then Engineer to the Water Department (Mr. J. W. Gray) and Mr. James Mansergh, M.Inst.C.E., to report what works they would recommend for giving such an additional water supply as would, with the existing sources, provide for periods of 25 and 50 years respectively. In the following year, it was reported that the yield of the existing water-works would fall short of the maximum demand in 1893 and of the average demand in 1900; that the cost of additional works necessary to secure all the water that could be yielded by the existing area of supply would be very nearly £1,000,000; that such works would provide for the requirements of 20 years only; and, finally, that to get a thoroughly satisfactory supply it would be necessary to go to Wales, and that of all the Welsh streams the Elan and Claerwen were by far the most suitable.

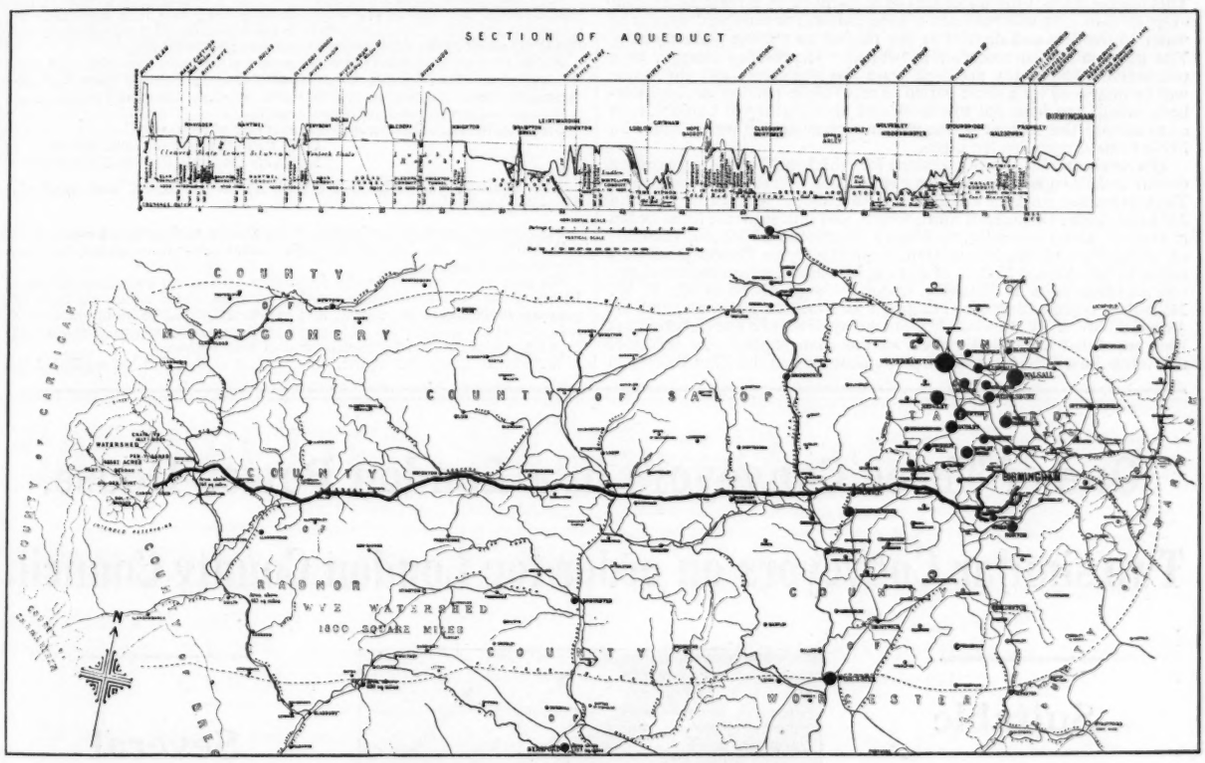
The matter came before the Council for discussion, and the following propositions were put to the vote: "(1) That the Water Committee be authorized to obtain from the Engineers, as soon as possible, further reports as to the works proposed, together with estimates of their cost;" and (2) "That they should be authorized to proceed in the meantime with the preparation of plans, references, and other things necessary to enable the Corporation to promote a Bill before Parliament, and for that purpose to obtain all such professional assistance as they might consider necessary." The Council held two meetings to consider the subject, and at the second the resolutions were carried by 51 votes in the affirmative and none against. The financial estimate and details of the proposed works were submitted in due course. Designs and estimates were produced for six reservoirs, and for a conduit sufficient to convey 67½ million gallons of water per day—an amount not expected to be required until 50 or 60 years hence. The total parliamentary estimate for the ultimate works was £6,600,000, or for three reservoirs and two lines of pipes £3,755,350; this figure including the cost of high-level reservoirs at Northfield and Warley, and additional mains and improvements to the distributing plant. The Council approved with unanimity of the draft Bill; but at the town's meeting there was some opposition by ratepayers, who feared the proposed expenditure, and entertained a vague idea that the needs of the case could be met in some less costly manner. A poll was demanded, when 4016 burgesses gave their votes in favour of the Bill and 563 against it. The Bill was accordingly promoted; and, after much opposition from interested persons and authorities, it received the Royal Assent on June 27, 1892. In the following October, Mr. Mansergh was instructed to proceed with the work. A second short Bill was obtained in 1895, giving compulsory powers of acquiring land for the deposit of spoil in making the aqueduct, and also to authorize a short railway. Then came the work of completing the purchase of lands and rights upon the watershed. With one exception, these purchases were effected by agreement; but arbitration was found necessary in connection with the Dderw Estate, for which the owner claimed £36,709 and the Corporation offered £10,265. The amount ultimately paid was £15,737.

The Welsh gathering-ground contains 45,562 acres, or 71 square miles, with an elevation varying from 700 to 2100 feet above the level of the sea. It lies in Cardiganshire and Radnorshire, 80 miles due west of Birmingham. It consists of wild moorland, and at the time of the beginning of the work the entire population did not exceed 180. The Water Committee considered it was their duty to provide water for a period of 50 years in advance; and for this they calculated that 75 million gallons a day would be the maximum supply which Birmingham would then require in dry weather. The rainfall of the gathering-ground has been calculated at 66 inches per annum; and

Mr. Mansergh estimates that it will be possible to collect 40 inches of the total, which would be ample to furnish all the water required 50 years hence.

As planned for the entire scheme, which, however, will not require completing for many years to come, the works in the Elan Valley consist of six separate reservoirs—the lower and largest being upon the site of the junction of the Rivers Elan and Claerwen, two others extending upward and northward on the Elan River, already finished; and three, extending to the north-west on the Claerwen, of which the lower one is not completed. These two chains of reservoirs are separated the one from the other by a series of bold elevations belonging to the Cwm-Toyddwyr Hills. To understand the manner in which these reservoirs are constructed, and their relation to each other, the reader must suppose he is entering the valley from Rhayader by the Caban gorge. Upon the right are the steep slopes of the mountain Craig-y-Foel; while upon the left is a somewhat similar elevation—the Cnwth. From slope to slope has been erected a massive dam, rising 122 feet from the bed of the river, and having a length at the top of 600 feet. The purpose of this dam and of the greater portion of the Caban reservoir is not to store water for Birmingham, but to furnish the means for feeding the River Wye, of which the Elan is a tributary, while Birmingham takes water from higher up the stream. Accordingly, a second dam—Careg-Ddu—has been constructed to cut off the uppermost two miles or so of the reservoir on the line of the Elan. This dam rises to a level about 40 feet short of the Caban dam; and when the reservoir is full, it will be submerged to this depth. Its whereabouts would not be manifest were it not that it is used as the foundation for a fine viaduct of twelve lofty arches, to carry the main carriage road from one side of the valley to the other. This is one of the most picturesque features of the Elan Valley works. It is called "the submerged dam," and the aqueduct to convey the water to Birmingham begins just above it. In a period of drought, when the top water of the lower section of the Caban reservoir falls too low for Birmingham, all the water held back by the submerged dam will be available; and into the storage behind this barrier will descend the waters from the two reservoirs higher up the Elan Valley, as well as those from the Claerwen reservoirs, which are to reach this point by means of a tunnel through the intervening hill, known as the Dol-y-Mynach tunnel. By this arrangement Birmingham, in a short time, will be able to depend upon its first instalment of 27 million gallons a day, while furnishing from the lower reservoir a steady flow of another 27 million gallons daily for the benefit of the River Wye. The addition hereafter of the Claerwen reservoirs will give an ultimate supply of 75 million gallons daily.

Immediately above the upper section of the Caban Lake comes the Pen-y-Gareg reservoir, which is a little less than 2 miles long and ¼ mile broad at its widest point. This water, too, is held back by a fine dam, 128 feet high from the centre of the river bed, and 525 feet from bank to bank. There is no roadway over this dam; but there is a passage in the masonry by which access is gained to the valve-tower, from which the sluice at the base will be governed. The Pen-y-Gareg reservoir holds 1320 million gallons of water, and has been complete since last December. The topmost of the Claerwen reservoirs, known as Craig Goch, is also complete, and has a capacity of 2000 million gallons. It is close upon 2 miles long from the foot to the tail, and is created by a dam a fraction longer at its upper margin than that at Caban, but less in height except at the very centre of the river bed,



PLAN SHOWING THE COURSE OF THE AQUEDUCT.

where the vertical measurement is only 2 feet short of the Caban. This dam has a roadway across, carried upon arches, which add to its picturesque appearance. A portion of the Dol-y-Mynach dam, on the Claerwen, has been constructed, as also the tunnel from above it, to the upper section of the Caban reservoir. The Dol-y-Mynach and the two other Claerwen reservoirs—Cil Oerwynt and Pant-y-Beddau—will be completed in the future, if the growth in the demand for water should render them necessary. The following table furnishes particulars in regard to the reservoirs:—

Name.	Capacity.	Water Area.	Height of Dam.	Top Water Level Above Ord. Datum.
	Million Gallons.	Acres.	Feet.	Feet.
Caban Coch	7540	497	122	820
Pen-y-Gareg	1320	124	128	945
Craig-Goch	2000	217	120	1040
Dol-y-Mynach	1500	148	101	900
Cil Oerwynt	3100	269	109	1095
Pant-y-Beddau	1900	244	98	1325

As already mentioned, from the submerged dam will start the aqueduct by which the water will be conveyed to Birmingham. The distance to be traversed is 73½ miles, and the fall is 170 feet—a gradient only just sufficient to keep the stream of water steadily flowing onwards. It will travel at the rate of rather less than 2 miles an hour. A glance at the accompanying map (reproduced from one lent to us by Messrs. James Mansergh and Sons) will show the route taken. The aqueduct consists of four principal classes of work—tunnels, "cut and cover," short lengths of square section constructed with binding girders, and a considerable length of syphons. The tunnelling, "cut and cover," and girder work are of sufficient capacity for the whole ultimate supply; and where bridges for supporting the syphons are necessary, they are constructed to take both the present and the future pipes. At the point where the aqueduct starts behind the submerged dam, a valve-house, with screens to exclude any large floating objects, admits the water into the mile and a quarter of brick-lined tunnel through Craig-y-Foel. The tunnel emerges upon the hillside nearly half a mile nearer Rhayader than the Caban dam. Here "cut and cover" should have formed the immediate continuation; but some two years ago an unfortunate experience of the Liverpool Corporation, in the choking of their conduit by a vegetable growth, indicated the desirability of rough filtering to remove the elements giving rise to this condition. Accordingly, a portion of the bank has been cut away to afford space for the interposition of a series of 30 filter-beds. These, of which the greater number have still to be constructed, are arranged between two conduits. The tunnel will deliver the water into the conduit on the south side, and from this it will pass through the filter-beds to the conduit on the north side, whence it will resume its eastward journey.

It will be seen from the plan that the conduit does not take a straight line to Birmingham, as this would have involved too much outlay in overcoming topographical inequalities. It rather follows the contour of the land, but the deviation from the direct line nowhere exceeds about 2 miles. Just before reaching Rhayader, a syphon some two-thirds of a mile in length is necessary to cross a rather deep depression,

through which flows the Caethon Brook. Slightly to the east of Rhayader, a syphon is again required to cross the River Wye. Short bits of tunnel intervene between Rhayader and Nantmel, where a syphon is used at the crossing of the Dulas. For the crossing of the Ithon, a short bridge is employed; and then comes the chief tunnel upon the aqueduct—that from Dolan to Bleddfa—nearly 4½ miles in length. The valley of the Lug is next syphoned, and then follow some 2½ miles of tunnelling to within a short distance of Knighton, in the valley of the Teme, which here intervenes, to some extent parallel to the direction of the conduit. The elevation of the exit from the tunnel is revealed by the valve-house, which stands prominently on the side of Garth Hill, at Knighton. In the 9 miles above indicated, the syphon pipes rise over the hills and sink with the depressions till the normal gradient is reached at Downton, which gives its name to this important syphon. Through Bringwood Chase and Whitecliff Woods the aqueduct makes its way, chiefly by "cut and cover," towards Ludlow, near to which town occurs one of the most picturesque architectural objects on the aqueduct—a series of arches, which take the pipes across the charming depression known as Deepwood Dingle. Syphon pipes again intervene from the neighbourhood of Cleobury Mortimer, through the Forest of Wyre, to the high ground on the Stourbridge side of Hagley Hill. The pipes are carried over the Severn by a fine bridge between Bewdley and Arley; and there is an ingenious arrangement whereby the pipes themselves make a crossing of the Stour near Wolverley. The conduit (now "cut and cover") crosses Hagley Road, goes through Hagley Wood, skirts Uffmoor Wood, tunnels under the Halesowen-Bromsgrove Road near Hunnington, and at length, by a short tunnel, ends in the Frankley reservoir, on Frankley Hill, situated about midway between Selly Oak and Clent. This reservoir has a top water area of upwards of 25 acres, and a depth of 31 ft. 6 in. It will hold 200 million gallons, or ten days' supply of water to the city and district at the rate of 20 million gallons daily. The purpose of the reservoir is twofold. It provides storage, as a precaution against any accident upon the aqueduct; and the water will be improved by a short period of rest before passing to the filter-beds, which are intended to clarify and also slightly to harden it, so as to obviate the solvent action which pure mountain water would be likely to have upon leaden pipes.

The work on the several sections (of which we hope to give more details in subsequent issues) was carried out by the following firms: The first section, from the Caethon to Dolau, about 13½ miles, by Sir John Aird and Sons; the second, third, fourth, and fifth sections, from Dolau to Hagley, about 51¾ miles, by Messrs. Morrison and Mason, Limited, of Glasgow; and the last section, from Hagley to Frankley, about 5 miles, by Mr. Abram Kellett, of Ealing, who also constructed the reservoir and filter-beds at Frankley, under the supervision of Mr. F. W. Macaulay, representing Mr. Mansergh as Resident Engineer, and his Assistant, Mr. A. W. Lewis. Mr. Macaulay, it may be remembered, has been appointed Resident Engineer of the Elan supply. As holder of this office, he will be head of the permanent staff in the Elan Valley, on the aqueduct, at Frankley, and at the Warley and Northfield reservoirs, and will in due course take up his residence at some central position, such as Ludlow.

The Inaugural Ceremony.

The spot selected for the inaugural ceremony was at the Foel filter-beds, and to witness it many thousands of people from Birmingham and elsewhere assembled. A platform had been specially constructed, and at this the Royal party alighted from the train which had brought them from Swansea *viâ* Rhayader. Their Majesties were received by the Bishop of St. David's, the Chairman of the Birmingham Water Committee (Alderman Lawley Parker), the members of the Committee, the Engineer (Mr. James Mansergh), the Resident Engineer (Mr. G. N. Yourdi), and the Secretary (Mr. E. Anthony Lees). The Recorder of Birmingham (Mr. J. S. Dugdale, K.C.) read the following address of the Corporation:—

To Their Most Excellent Majesties the King and Queen.

May it Please your Majesties,—We, your Majesties' faithful and loyal subjects, the Lord Mayor, Aldermen, and Citizens of your city of Birmingham, in Council assembled, humbly approach your Royal presence on this occasion with feelings of deep gratitude.

The great undertaking which your Majesties have graciously consented to recognize, the provision of an abundant supply of pure water to our city and neighbourhood, has been a work of many years' duration, involving much thought, great cost, and arduous labour. But *finis coronat opus*; and to-day your Majesties honour the city by opening our Elan Water-Works, the source, as we hope, of increased health and comfort to our great industrial population.

Your Majesties' names are identified with the cause of peace. Great public works are among the victories of peace; and it is with heartfelt recognition of your Majesties' efforts in this direction that we welcome your Royal presence at the completion of this great undertaking.

We thank your Majesties most sincerely for your gracious visit, and, with renewed assurances of our loyalty and duty, we humbly pray for your Majesties' future happiness, and that you may long be spared to reign over a prosperous, happy, and contented people.

Given under our common seal this 21st day of July, 1904.

HALLEWELL ROGERS, *Lord Mayor.*
EDWARD ORFORD SMITH, *Town Clerk.*

The Lord Mayor handed the address to the King, who read the following reply:—

I thank you sincerely, on behalf of the Queen and myself, for your loyal and dutiful address, and for the good wishes towards us which you have therein expressed.

We take great interest in the important scheme for providing the city of Birmingham with an abundant supply of pure water which we have the pleasure of inaugurating to-day, and are heartily glad of an opportunity of celebrating the completion of a great public work so essential to the well-being of a vast community such as that of Birmingham.

We admire the public spirit, energy, and skill which have effected the

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accomplishment of so beneficent an undertaking, and cordially endorse your hope that the Elan Water-Works may be the source of increased health and comfort to your great industrial population.

That the blessings of peace may be long enjoyed by our country, and time be thus gained for the development of commerce and for effecting improvements in every department of our national life, is our fervent desire.

The King then conferred the honour of knighthood upon the Lord Mayor, who proceeded to present to him the Chairman of the Water Committee, the Engineer, the Resident Engineer, and the Secretary. He then asked His Majesty if he would be pleased to open the new water supply. For this purpose Mr. Mansergh directed the King's attention to a small wheel, by turning which he released an automatic shutter in each of the six filter-beds now in use; and the water immediately began to rise in the valve chambers, and flow over the sills into the aqueduct. At the conclusion of the ceremony, prayer was offered by the Bishop of St. David's.

The Royal party and the invited guests then re-entered the train and proceeded up the valley to inspect the reservoirs and works. On reaching the Craig Goch reservoir, which was full to overflowing, the King and Queen alighted, and proceeded along the roadway over the dam to a raised platform opposite the valve-tower. Their Majesties were evidently thoroughly pleased with what they saw, and the King chatted with Sir Hallewell Rogers and Mr. Mansergh as the wonderful strength and beautiful proportions of the huge dam were pointed out to him. His Majesty gazed for some moments down upon the stream at the base of the dam, and then passed into the valve-tower, the function of which was explained to him by Mr. Mansergh, who took advantage of the occasion to present the Queen with two volumes of photographs of the works. The inspection over, the Royal party returned to the temporary station at Craig Goch, and took train for Nant Madog, where luncheon was served. During the journey, both the King and the Queen expressed themselves in high terms of admiration at the gigantic character of the scheme. At the conclusion of the repast, the Lord Mayor proposed the only toast—"The health of their Majesties the King and Queen"—which was followed by the singing of the National Anthem. The Royal party left at three o'clock for Rhayader, where they took train for London, which was reached by eight o'clock.

METROPOLITAN WATER BOARD.

Issue of Stock—The Board's Victory in the Lords—The Chairman's Services—Revision of Water-Charges.

A Meeting of the Board was held on Friday, at the offices of the Metropolitan Asylums Board—Mr. R. M. BEACHCROFT in the chair.

The Finance Committee presented a report stating that they were now in a position to make the necessary recommendations with a view to the issue of stock required to give effect to the agreements which the Board, at their meeting on the 8th inst., resolved to enter into with the Water Companies other than the New River Company. At that meeting, the Chairman of the Committee (Lord Welby) reported that of the total amount payable under the arbitration awards as compensation to the Companies referred to was £24,695,200, and that acceptances of the equivalent in water stock on the terms offered by the Board (£109 10s. of stock for each £100 of cash awarded) had been received to the amount of £23,255,804. Since then, the Committee stated, further applications for stock had been received from the Companies. The total amount of acceptances was now represented by £23,949,008 cash; the equivalent of which in stock at the agreed price was £26,224,197; the balance remaining to be provided for in cash being £746,161. These figures, the Committee thought, might still be modified, as they had fallen in with the suggestion that the Companies' shareholders should be allowed a further extension of time up to Thursday within which to request an allotment of stock in lieu of cash. The Committee recommended that, subject to the provisions of the Metropolitan Water Stock Regulations, 1903, the Metropolitan Water Board should, in exercise of their powers in that behalf conferred by the Metropolis Water Act, 1902, create stock, to be designated Metropolitan Water (B) stock, and to be issued to an amount which should not exceed £26,285,323.

Lord WELBY, in moving the adoption of the report, said the negotiations for the transfer of the undertakings were now practically completed; and out of the six agreements four had been already signed and only awaited ratification by the Court of Arbitration, to which they would be submitted next week, while those remaining would be signed within a day or two. Since the report had been printed, there were two alterations in the figures to which it was necessary to call attention. The awards in cash amounted to £24,695,200, and the stock equivalent accepted in lieu of cash amounted to £24,004,861, which would be represented by water stock (B) amounting to £26,285,323. The outstanding balance which would have to be paid in cash would amount to £690,338. There were one or two points still pending between the Companies and the Board which might involve a further sum of perhaps £30,000; so that the actual amount to be found in cash would be somewhere about £700,000. The arrangement made with the Companies was that all transactions with them should close on the 1st of September, on which date the stock and cash would be handed over. The Finance Committee had made arrangements with the Bank of England by which the necessary sum would be temporarily advanced to the Board, and the Committee would, at a convenient time in the autumn, ask the Board to issue a loan in water stock which would be necessary to wind up all their engagements. In addition to the £700,000, there were various sums which were due on capital account, and had been borrowed when they had no resources, and thus formed their capital commitments. It was possible that the total sum which would have to be raised would be something approaching £2,000,000. He thought the Committee could submit this report with every confidence, because it was a great result that this very large transaction had been effected without any disturbance of the Money Market, without any friction between

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WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

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the Companies and the Board, and without any questions being raised which would be open to criticism. Generally speaking, the arrangement had been satisfactory. When the question of raising a loan to pay out all the Companies was considered, the Committee came to the conclusion that 92½, with a commission of ¾ per cent. for the underwriting, would be a reasonable figure; and the Bank of England independently arrived at the same result. When the negotiations with the Companies were revived, and they agreed to accept water stock at 109⅓, this figure was found to be equal to a loan at £91 6s. 6d., and the price at which the stock was now quoted—viz., 92⅛—was found to be a shade below the price which the Committee considered would be a fair one to arrive at. He therefore thought the figures showed that the interests of the ratepayers had been duly consulted.

The report was adopted.

The Special Arbitration Committee reported that on the 18th ult. they submitted to the Board the points of law arising before the Court of Arbitration in connection with the New River Company's case, in respect of which judgments had been delivered by the Court of Appeal. These points had reference to the following questions: (1) The limitation of the Company's dividend to 10 per cent. (2) The inclusion in the Company's undertaking of the Clerkenwell Estate, and other lands and real estate not directly used for, or connected with, the water supply. (3) The sums paid by the Company in respect of land-tax. (4) The application of the "sinking fund" clauses.

The judgment of the Court of Appeal was in favour of the Company on the first three questions, and of the Board on the last point. Acting upon instructions, the Committee appealed to the House of Lords against the judgments delivered adversely to the Board. The Company, on the other hand, appealed against the decision on the "sinking fund" clause. The Committee now reported that the House of Lords had given judgment on all points in favour of the Board.* They had directed that copies of the judgment should be circulated for the information of members; and it would be seen therefrom that the decisions of the Arbitrators had been upheld on all points.

The report was adopted.

In a supplementary report, the Special Arbitration Committee expressed their desire to submit to the Board their sense of the great services rendered by their Chairman (Mr. Beachcroft) in the conduct of the arbitrations with the several Water Companies, involving claims of unprecedented magnitude and importance, and in the negotiations and arrangements in other cases dealt with by the Committee. The Chairman, ever since his appointment on April 13, 1903, had devoted almost continuously his time and his great ability and energy to the interests of the Board; and the Committee considered that it was largely due to the sacrifices thus made that the results obtained had been satisfactory.

The VICE-CHAIRMAN (Mr. Glass) moved—"That the Board do record their appreciation of the prolonged and zealous labours of their Chairman in reference to the conduct of the arbitrations with the several Water Companies, involving claims of unprecedented magnitude and importance, and their admiration of the great ability and energy which he has unsparingly devoted to the work, and do offer him their sincere thanks for the services which he has, at great personal sacrifice, rendered to the Board and the ratepayers of the Metropolis."

Mr. PICKERSGILL seconded the motion, and it was carried.

The CHAIRMAN, in acknowledging the compliment, said he greatly appreciated the kindly expression, which was more than a reward for any labours he had expended. He believed that it had seldom fallen to the lot of a body of gentlemen to handle so many legal questions, involving a sum amounting to between £34,000,000 and £35,000,000, and to arrive at a settlement within nine months, notwithstanding that there were several appeals to the Court of Appeal and an important appeal to the House of Lords, all of which had been disposed of.

The Appeal and Assessment Committee reported that they had had under consideration several applications for revision of water-charges. Many of these applications involved questions of principle; and at the present time they considered it inadvisable to establish decisions which might be taken as precedents. They had therefore given the Clerk the necessary instructions in the cases which had been brought before them.

Other business was transacted, and the Board adjourned.

* The text of the judgments will be found in our "Legal Intelligence" to-day.—ED. J.G.L.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The accounts of the Edinburgh and Leith Gas Commissioners for the year to May 15 have now been audited and issued. They show that the share capital has been reduced from £370,000 to £347,550 by the redemption of annuities, for which they have paid £22,450, reducing them from £35,200 to £33,079. In the course of the past year, the reduction amounted to £1114. The loan capital authorized is £1,400,000, and of this there remains to be borrowed £427,141. The capital expenditure during the twelve months amounted to £68,588, as compared with £87,255 in the year preceding. Of this outlay, £43,561 was at Granton; making the total expenditure upon this station £573,649. Main and service pipes and cost of laying amounted to £17,101, as compared with £10,235; and meters cost £3537, as compared with £1667. The capital value of works and plant is £1,355,207, against £1,290,300. Mortgages have been repaid out of sinking fund to the amount of £20,770. The quantity of gas sold was 1,836,267,000 cubic feet—an increase over the preceding year of 33,203,000 feet. The revenue from gas was £259,410, as compared with £277,248, the lessened revenue being due to a reduction of 3d. per 1000 cubic feet in the price. There was realized for coke,

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£17,677, as compared with £14,183; for tar and ammoniacal liquor £18,239, as compared with £20,587; and for sulphate of ammonia (less working expenses) £20,045, as compared with £16,467. The total revenue was £315,879, as compared with £329,052. The total expenditure was £236,409, which leaves a balance to profit and loss account of £79,470. The quantity of coal carbonized was 179,276 tons, as compared with 164,976 tons; and 1246 tons of oil were used for carburetted water gas, as compared with 3835 tons. The cost of coal was £117,218, as compared with £108,581; and of oil, £3584, as compared with £7619. Oil, water, and sundries used at works amounted to £4064, and purifying material and wages of purifier men to £4403, being £8467, as against £10,890 for these two items in the previous year. Salaries and wages at works cost £31,327, as compared with £43,663; and repairs and maintenance of works cost £11,080, as compared with £12,459. The total cost of manufacturing gas was £171,678, as compared with £183,214—a decrease of £11,536. Distribution cost £30,876, as compared with £29,651. Management cost £10,445, as compared with £9782. Feu-duties, rates, and taxes amounted to £13,974, as compared with £12,491; pensions and allowances to £1734, as compared with £1037; law and parliamentary expenses to £509, as compared with £1967; and discounts, abatements, and bad debts to £7191, as compared with £8360. The sinking fund for the repayment of money borrowed was increased from £37,797 to £48,114, and it now stands, after repayment of the £20,770, at £27,344. The sinking fund for the redemption of annuities was increased from £153,343 to £165,701. A sum of £62,014 has been expended in redemption—of which £5431 was spent last year; and the fund now stands at £103,687. The total amount of both sinking funds is at present £131,032. There is, besides, a reserve fund of £5161. The gas-stove account began the year with stoves on hand or lent on hire of the value of £15,252, as compared with £17,231; during the year, stoves were purchased to the value of £1558, as compared with £2100; and there was expended in the repair and fitting up of stoves £3388, as compared with £2935. The amount received for the hire of stoves was £3296, as compared with £3164; £892 received for stoves sold, as compared with £915; the amount received for fitting up gas-fires £299, as compared with £245; and there is a deficiency on fittings, charged to revenue account, of £3194, as compared with £2689. Then the value of stoves on hand or lent on hire at the end of the year is stated at £12,516.

Mr. W. M'Crae, the Manager of the Falkirk Corporation Gas-Works, has submitted his report upon the working of the undertaking during the year ending May 15, to the Town Council, who have adopted it. The quantity of gas manufactured was 149,767,500 cubic feet; being an increase over the preceding year of 7,250,000 feet, or at the rate of 5·037 per cent. The quantity of gas accounted for was 130,976,000 feet—an increase of 5,631,000 cubic feet. The percentage of unaccounted-for gas—12·54—was practically the same as in the preceding twelve months. During the year, 16,174 tons of coal were carbonized, which yielded, on an average, 9260 cubic feet of gas, as compared with 9520 cubic feet. The coke and breeze sold amounted to 8076 tons, being 900 tons more than in the previous year, or an increased yield of 0·11 cwt. per ton of coal carbonized. The tar and ammoniacal liquor sold amounted to 841,615 gallons; being 40,869 gallons more than in the previous year. There were 128 new services laid, as compared with 104. There was an increase of 435 in the number of consumers, as compared with 383; and of the 435 new consumers, 218 have been supplied with prepayment meters. On May 15 last there were in all 7169 consumers, of whom 1766 use prepayment meters and 5403 ordinary meters.

The annual meeting of the Berwick and Tweedmouth Gaslight Company, Limited, was held on Wednesday. It was reported that the net revenue for the year amounted to £6747, of which £5641 has been received for gas, £963 for coke, tar, lime, &c.; and £141 for meter rents. The expenditure was £5518, of which the cost of coal amounted to £3318; wages amounted to £587; salaries to £390; repairs and maintenance of works and plant, including renewal of retorts, service-pipes, &c., to £444; parochial rates to £200; repairing of meters to £117; and insurance and depreciation to £195. The balance of profit amounted to £1229. A dividend at the rate of 10 per cent., free of income-tax, was declared.

I have mentioned twice already the dispute between the Town Council of Carnoustie and the Gas Company over the account for gas used in the public lighting. The subject was again before the Council on Wednesday. Originally the account was £212; but the Company reduced it to £160. The Council, feeling that they had been able to squeeze the Company so effectually, struck off other £10, and resolved to send a cheque for £150 in full. This is surely an instance of ill-requited generosity.

The annual meeting of the Montrose Gaslight Company was held on Wednesday. The accounts showed a credit balance of £1020. The Chairman said that the figures spoke for themselves. They were paying a dividend at the rate of £1 15s. per share. After declaring the dividend, there would be a balance of £145 remaining. Mr. T. D. Hall, the Manager, reported that during the year ending June 30 the quantity of gas manufactured was 28,111,800 cubic feet—a decrease of 1,448,700 cubic feet upon the preceding twelve months. The gas sold amounted to 22,200,200 cubic feet—a decrease of 991,100 feet. The consumers numbered 2475—an increase of 30. At the beginning of the year there were 320 prepayment meters in use, and by the end of the year the number was 530. The Chairman reported that, owing to the state of the health of Mr. Hall, he had resigned the post of Manager, and that the Directors had appointed Mr. A. Mackay, of Glasgow, as his successor. The action of the Directors was unanimously confirmed.

The first annual report by the Directors of the Crieff Gaslight Company, since it was formed into a limited liability Company, has been issued. It states the profit for the year at £1021, which the Directors propose to apply in payment of a dividend at the rate of 7 per cent., and in placing £193 to a reserve fund. The income was £4832, and the expenditure £3701.

It is proposed to greatly increase the number of incandescent gas-

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lamps in the lighting of the streets of Dundee. The number of lamps to be dealt with is mentioned at 1200. There will still be about 1000 lamps with flat-flame burners. Gas is to be supplied at a reduced price; and it is anticipated that the cost of lighting generally will not be higher than at present.

The Grangemouth Gas Company have reduced the price of gas from 3s. 9d. to 3s. 4d. per 1000 cubic feet.

The annual meeting of the Selkirk Gaslight Company was held on Tuesday. The quantity of gas manufactured during the year ending April 30 was 29,470,000 cubic feet—a decrease of 841,451 feet upon the previous year. The quantity sold, used at the works, or otherwise accounted for, was 27,943,300 cubic feet. The profit for the year amounted to £1337. A dividend at the rate of 10 per cent. was declared; and the price of gas was reduced from 2s. 11d. to 2s. 8½d. per 1000 cubic feet.

The Ferry Port-on-Craig Gaslight Company's annual meeting was held on Tuesday. The consumption of gas showed an increase of over 800,000 cubic feet. The profits for the year amounted to £283. A dividend at the rate of 6¼ per cent. was declared.

It was reported to the Water Committee of the Dundee Town Council on Tuesday that, in consequence of dry and hot weather, the Loch of Lintrathen, from which the whole of the water supply of the city is taken, is lower at present than it has been since 1887. There is a daily consumption of nearly 12 million gallons of water, which is within 1½ millions of the carrying capacity of the mains.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 23.

Sulphate of Ammonia.

The tone of the market has been decidedly dull, and prices have barely been maintained, the closing quotations being £11 15s. per ton f.o.b. Hull, and £11 17s. 6d. to £11 18s. 9d. per ton f.o.b. Liverpool and Leith. The Continent remains immovable, and Spanish buyers are only interested in the autumn months or further ahead; so that the market has had to depend mainly upon requirements for covering July contracts. On the other hand, makers have their reduced output to dispose of; and they do not seem inclined to wait. In the forward position, the views of the makers and buyers are too widely divergent to admit of much business, although a moderate amount of business is being taken speculatively for delivery over the near months at the level of spot prices.

Nitrate of Soda.

This is firm in all positions, and, local supplies having become less abundant, spot prices have been advanced to 10s. and 10s. 3d. per cwt. for ordinary and refined qualities respectively. For spring delivery, dealers are quoting ordinary quality at 9s. 10½d. to 10s. per cwt.

LONDON, *July* 22.

Tar Products.

Markets are generally quiet, and there is not much doing. Pitch does not show any signs of improvement; and dealers are offering to sell all over next year at very low prices. More business has been done in South Wales for delivery early next year; but consumers now do not seem at all anxious to purchase over this period. The principal weakness is certainly in the Lancashire district, where there appear to be sellers at low prices for both prompt and forward delivery. The position of anthracene remains unchanged. There is nothing offering at the moment, and London makers appear determined not to reduce their price for forward delivery. There is a little business still doing in 90 per cent. benzol at 9d. per gallon f.o.b. London; but 50-90 per cent. is very dull of sale, and there is no demand just at present. The demand for solvent naphtha still continues fairly good for home consumption. In crude carbolic, consumers are still endeavouring to depress values; but it is reported that offers of 1s. 10½d. are now being made for forward delivery. Most of the largest makers, however, are well sold; and they do not seem inclined to offer anything at under 2s. for either prompt or forward delivery. Crystals are certainly quiet, and dealers are offering to sell for forward delivery at low prices. There is, however, a general feeling here that there was no necessity for the recent depression in the value of crude and that we are likely to see a revival in price at an early date. There is still a strong demand in the North for creosote; business having been done at 1⅜d. for delivery up to the end of the present year. In London, makers now ask $1\frac{9}{16}$d. to 1⅝d.; but consumers are not prepared to pay more than 1½d. in any position.

The average values during the week were: Tar, 17s. to 21s. 6d. Pitch, London, 31s.; east coast, 30s. to 30s. 6d.; west coast, 28s. to 29s. Benzol, 90 per cent., 9d.; 50-90 per cent., 7d. Toluol, 6½d. to 6⅝d. Crude naphtha, 3d.; solvent naphtha, 7d. to 8½d.; heavy naphtha, 9½d. to 10d. Creosote, London, 1½d. to $1\frac{9}{16}$d.; North, 1⅜d. Heavy oils, $2\frac{1}{16}$d. to 2⅛d. Carbolic acid, 60 per cent., 1s. 10½d. to 1s. 11d. Refined naphthalene, £4 10s. to £8; salts, 22s. to 24s. Anthracene, "A" quality, 1¾d. to 1⅞d.; "B" quality, 1d., nominal.

Sulphate of Ammonia.

The market continues very quiet, and there is certainly an absence of demand, especially for early delivery. Beckton now ask £12 per ton for July-September delivery, but do not seem able to arrange business at this price just at present, although there is no doubt that there are buyers at very nearly this figure. The South Metropolitan Company made sales at £12 2s. 6d. on their own special terms; and this still remains their quotation for prompt delivery. In Hull, business has been done at as low as £11 13s. 9d. for shipment early in August; and there does not seem to be much demand at present for shipment from this port. There is no business of any importance to report at Leith. The nominal value may be taken as about £11 17s. 6d., although at this price buyers are not anxious to purchase for early shipment.

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COAL TRADE REPORTS.

Lancashire Coal Trade.

The same dull leaven permeates our coal exchanges as reported last week. Only in the case of slack is there any activity. Supplies being limited, the demand is well maintained at prices which show no tendency to deteriorate. No information is yet forthcoming as to how the operative miners will receive the proposed reduction of 5 per cent. in wages. It is not expected that any combined resistance will be offered; for having been so long on short time, the men are not in a position strong enough monetarily to hold out for a long period, and with a dull market colliery owners would not be adversely affected to any serious extent. The effect of a strike would immediately enhance prices. Coal for foundry purposes keeps fairly up to current rates. Coke is in moderate request, and cannel difficult to sell. Water gas is more and more favoured by municipal corporations; and this promises in time to adversely affect gas-producing qualities of coal. The sale of house coal does not improve. The barest quantities are disposed of—just sufficient to meet passing requirements. Quotations, however, for all sorts are compassed within the following figures: Best house-fire description 13s. to 14s. per ton, seconds 11s. to 12s., and common sorts 8s. 6d. to 9s. 6d. and 10s. Steam and forge coals are 8s. 6d. to 8s. 9d. per ton for ordinary qualities, and 8s. to 8s. 3d. for common. Best slacks are 6s. to 6s. 6d. per ton at the pit, medium 5s. to 5s. 6d., and common 4s. to 4s. 6d.

Northern Coal Trade.

The coal trade is rather quieter, the hot weather having minimized the demand in many cases; but there is still a full export. Best Northumbrian steam coals are from 10s. to 10s. 3d. per ton f.o.b., second-class steams are 8s. 9d., and steam smalls 3s. 10½d. to 4s. The collieries are well employed, with a steady inquiry, and with a generally good production. In the gas coal trade, the demand begins to increase slowly, and prices for good qualities vary from 7s. 10½d. to 8s. 3d. per ton f.o.b. Two contracts for export to Austria are reported; and the prices seem to range from about 7s. 8d. to 7s. 11d. per ton, according to quality, f.o.b., with deliveries over a year from September. The prices seem to indicate an expected steadiness in values for some little time. Gas coke is still rather scarce, with a good export demand for the works that usually ship freely. The price varies from 13s. to 13s. 4½d. per ton f.o.b.

Scotch Coal Trade.

There are no quotations this week; the Coal Exchange being closed on account of the holidays. The shipments reported amounted to 250,430 tons—an increase of 21,910 tons upon the preceding week, and of 14,629 tons upon the corresponding week of last year. For the year to date, the total shipments have amounted to 6,004,115 tons—an increase of 181,905 tons upon the same period of 1903.

The Affairs of the Stockport Gas Department.—The Gas Committee of the Stockport Corporation have held two sittings for the purpose of investigating a number of charges of irregularity in the Gas Department which had been formulated by a councillor, who had a notice of motion before the Corporation at their last meeting with reference to the dismissal of a meter inspector. The Council decided that the Gas Committee should investigate the complaints; and after going fully into the matter, the Committee have come to the conclusion that the charges were not proved.

High Gas Pressure in Cambridge.—The Gas Examiner to the Cambridge Town Council (Mr. W. E. Pain) refers, in his last report, to the high pressure at which gas is supplied by the Gas Company. He says: "The pressure, which is required to be not less than 7-10ths, has varied from 21-10ths to 30-10ths. This appears to be an ever-increasing quantity. The first page of readings in the register commencing Jan. 1, 1897, gives an average pressure in tenths of 16⅔, the same in January, 1901, gives 21½, and this year, 26⅔. It is much to be regretted that the Gas-Works Clauses Act does not place a limit on this, and so compel the Company and consumers to provide services suitable to their requirements."

Yorkshire Water and Lead Poisoning.—Dr. Kaye, the West Riding Medical Officer of Health, has issued a report dealing with the public water supplies of the district which have a plumbo-solvent tendency, and it is to be followed by action on the part of the county authority. He has recently been supplied with samples of water drawn after standing all night in the ordinary lead pipes; the number so received and examined being 110. He classifies the results in three groups. Group A comprises the water supplies in connection with which no lead was found in solution. The supplies in Group B—the lead in solution not exceeding 0·1 grain per gallon—are from Batley, Bradford, Holmfirth, Keighley, Huddersfield, Oldham, Ripon, and Stainland. Group C—lead in solution more than 0·1 grain per gallon—contains the following: Ashton and Dukinfield, Baildon, Barnsley, Dewsbury and Heckmondwike, Halifax, Rochdale, Sheffield, Shipley, Soyland, Yeadon. The matter is to be reported to the Local Government Board.

Lively Electricity at Stepney.—A good deal of alarm was caused in the neighbourhood of the Mile End Road, on the evening of last Saturday week, by a loud report, accompanied by a sheet of blue flame and dense columns of black smoke. Paving stones were shot high in the air; and the explosion made a hole in the ground 20 feet in circumference. Investigation showed that the electric cables had fused; and as a consequence all electric lights in the vicinity were extinguished. The fire brigade were promptly on the scene, as was also a break-down gang from the Commercial Gas Company, in charge of Mr. R. B. Steriker, the Company's Engineer for the eastern district. Unfortunately, two women and several children were knocked down by the force of the explosion, and had to be medically treated. The results must have been even more disastrous had the occurrence taken place at a busier time of the day. The inhabitants will be relieved to learn that a searching inquiry is to be made into the defects of the cable.

NO TROUBLE

The Trouble.

"A correspondent of the "IRONMONGER" asks for assistance in connection with the above matter. He says: "I have had some trouble with gas smoothing-irons, several of those I have sold having been brought back. All have been accompanied with one complaint—that after using them a little time (say, 20 minutes or so) the flame drops, and ceases to burn with that force and spurt which usually marks the use of these appliances. . . ."—"JOURNAL OF GAS LIGHTING," July 5, 1904.

The Remedy.

"The top bars of the cooker are made in three sections. . . . One of the sections has a small rectangular opening provided in it just above the simmering-burner, for the internal heating of gas-irons; and the arrangement is such that the iron can be inclined, and get the full benefit of the flame playing on the bottom inside. In calling attention to this, the firm suggest that it would not be a bad idea if gas suppliers would include a couple of irons with their cookers in lending them out, as 'ironing-day' would then be a sure contributor of a good addition to the consumption."—"JOURNAL OF GAS LIGHTING," June 21, 1904.

WITH RICHMOND'S GAS IRONS.

ADVERTISEMENT OF THE RICHMOND GAS STOVE AND METER CO., LTD., WARRINGTON AND STRATFORD.

Attleborough Public Lighting.—The Attleborough (Norfolk) Gas Company have entered into a contract for three years with the Parish Council for lighting the district. The whole of the street-lamps are to be converted from flat-flame burners to the incandescent system.

Spalding Without Water.—The town of Spalding, which receives its supply from Bourne, ten miles distant, was entirely without water last week, owing to a burst in the main at Pinchbeck West, midway between Spalding and Bourne. No water whatever passed through on Wednesday, and as soon as the tanks were exhausted, which was early in the afternoon, the supply was completely stopped, and it could not be resumed until next day.

Gas Supply in Fermoy.—In connection with the much agitated question of the lighting of Fermoy, an important Irish military station, the Urban District Council have received a letter from Mr. R. Bruce Anderson, the proprietor of the gas-works, offering to make a reduction in the price of gas, provided no obstruction is offered him in the opening of the roads. If this offer is not considered acceptable, he suggests that the Council should agree to purchase the gas-works from him, at a price to be fixed by arbitration; and he instances the recent transfer of the Omagh Gas-Works to the Local Authority for the sum of £26,880, as a guide to the price which should be fixed.

The Trouble at the West Bromwich Electricity Works. — A special meeting of the General Purposes Committee of the West Bromwich Town Council was held last Friday, under the presidency of the Mayor, to consider the trouble at the electricity works to which reference has already been made. The memorial, signed by the bulk of the employees of the department, was submitted, and after some discussion the Committee referred the whole matter to the Electric Lighting Committee for a complete investigation of the complaints made. This was agreed to on the understanding that if a thoroughly satisfactory report is not presented, the General Purposes Committee will go into the complaints.

Colne Valley Water Company.—The report of the Directors of this Company for the six months ending June 30 sets forth that the profit in respect of the revenue account amounted to £10,105. After transferring a further £500 to the contingency fund account, and paying the usual interest on the debenture stock and preference shares, there remains a balance of £9023. It is proposed to pay a dividend at the rate of 8 per cent. per annum on the 10 per cent. maximum dividend shares, and 7 per cent. on the 7 per cent. maximum dividend shares, which will leave £943 to be carried forward. For the corresponding period of 1903, the dividends were at the rate of 7½ and 7 per cent. respectively, and £532 was carried forward.

Rejection of the Proposed Water Scheme for Shrewsbury.—The ratepayers of Shrewsbury have emphatically pronounced against the new water scheme which has for some time been before them, which was to bring an upland supply from Church Pulverbatch, at a cost of £150,000. A vote of the town has been taken, and the result was made known last Wednesday. The figures are: Against the scheme, 2134; for it, 1334—majority against, 800. The opposition has come in the main from the poor people of the borough, who consider their wants are met by the present dual service. Another objection was that the proposed supply would be inferior to river water, though any use of the Severn as a source has been emphatically condemned by the Local Government Board.

Explosions in Gas-Works.—During the removal of the spent oxide from one of the purifiers at the Kidderminster Gas-Works last Tuesday, some escaping gas became ignited, and several men sustained injuries. Medical aid was at once summoned, and four of the men were removed to the Infirmary, where one was detained. Two of the others were able to return to work. An explosion of gas occurred last Friday night in the governor-house at the Cockermouth Gas-Works. It blew out the side wall for a distance of 15 feet, and lifted part of the roof; doing damage to the extent of £50. It appears that there was an escape of gas from an unsealed governor, and it was ignited by a small jet burning in the room above. Fortunately there was no one on the premises, and the explosion did not affect any other part of the works.

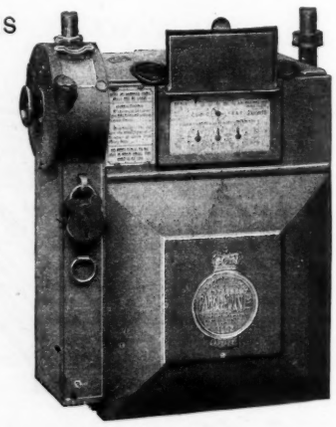
Sales of Shares.—Messrs. Harris and Jackson recently sold by auction a new issue of £12 10s. "B" shares in the Abingdon Gas Company at £14 10s. and £14 15s. each. At a sale by auction at Hyde last Wednesday, the following prices were realized for the Gas Company's shares: Six original shares of £10 each, bearing 10 per cent. dividend, £26 3s. apiece; three new £10 shares, 7½ per cent., £19 2s. 6d. each; and four new ordinary £10 shares, 7½ per cent., £19 4s. 6d. each—the purchaser taking all dividends accruing from Dec. 13. A few days ago, Messrs. Tootell and Sons sold by auction, £1534 of 5 per cent. capital stock (*ex div.*) and £250 of 3 per cent. debenture stock of the Maidstone Gas Company. The price realized for the capital stock (paying £7 12s. 6d. per cent.) was £137 per £100; while the debenture stock sold at the rate of £70 per cent.

A Darwen Auditor Objects to the Water Accounts.—Mr. J. Hindle Bury, one of the Elective Auditors at Darwen, has created a sensation by refusing to sign the annual accounts of the Corporation Water Department. He states that the balance-sheet of the department does not, in his opinion, show the actual state of affairs. The £27,974 put down for the purchase of gathering-ground includes an item of £15,217 for a number of farms, comprising about 215 acres, at a cost of more than £70 per acre. "In acquiring Sunnyhurst Wood," he says, "30 acres of this land have been commandeered by the Parks Committee, for I know no better term to describe a transaction for which there is no minute of the Council; so that while the Water Department is responsible for interest and sinking fund instalment on £2100, and ceases to receive the revenue hitherto accruing from this land, the general district fund derives the benefit without any cost whatever under the foregoing heads. This, in my estimation, is a serious and inequitable abrogation of the principles regulating corporate departmental book-keeping, and ought not to be allowed to continue; for if land purchased for a specific purpose is allowed to be diverted without any consideration, what is to hinder borrowed money being misapplied?

PARKINSON'S

SLOT INSTALLATIONS

FOR QUOTATIONS



WRITE—

PARKINSON AND W. & B. COWAN, LTD.
(*Parkinson Branch*),
COTTAGE LANE, CITY ROAD, LONDON.
BELL BARN ROAD, BIRMINGHAM.

Unprofitable Electric Lighting at Oldham.—According to the accounts of the electricity undertaking of the Oldham Corporation for the year ending March 25 last, the gross revenue was £25,973, and the gross expenditure £12,971; leaving a balance of £13,002 to go to the net revenue account. The interest on mortgages and deposits comes to £7687, the sinking fund to £6080, and bank interest to £6. This leaves a net loss of £771 for the year.

Reductions in Price.—At the last monthly meeting of the Selby District Council, it was decided, on the recommendation of the Gas and Water Committee, that the price of gas should be reduced, as from the 1st inst., as follows: Ordinary consumers, from 3s. 2d. to 2s. 10d. per 1000 cubic feet; prepayment consumers, from 3s. 4d. to 3s.; public lighting, from 3s. to 2s. 8d.; and private lamps, from 3s. 2d. to 2s. 10d., with an additional 2d. per 1000 cubic feet if the accounts are paid within two months. The Salford Corporation have reduced the price of gas 1d. per 1000 cubic feet.

Public Lighting of Bristol.—In a report by the City Engineer of Bristol (Mr. T. H. Yabbicom), he states that the number of ordinary gas-lamps in use this time last year was 8293; and during the twelve months 241 were added. There are 9 electric incandescent lamps and 47 oil-lamps. After exhaustive experiments with incandescent gas-burners, the Sanitary Committee have recommended to the Town Council that in future all new gas-lamps shall be provided with incandescent fittings, and that 500 of the old lamps shall be altered to this method of lighting. By this change, a burner will consume an average of 4 cubic feet of gas per hour during the 3978 hours it is lighted during a year, instead of 5 cubic feet with the ordinary flat-flame burner; and the illuminating power is increased from 15¾ to 70 candles.

Additional Capital for the Penrith Gas-Works.—Mr. H. P. Boulnois, M.Inst.C.E., one of the Inspectors of the Local Government Board, last Wednesday held an inquiry at the Public Offices, Penrith, into an application to borrow £7000 for extensions in connection with the gas-works and the laying of gas mains. Mr. G. Wainwright (Clerk to the Urban District Council) said that the proposed extensions were necessary to meet the demand for gas. In 1878, there were 800 consumers; now there were 1900, including 760 on the prepayment system. During the last five years, the average rate of increase in consumption was 2·2 million cubic feet, or a total consumption of 42⅜ million cubic feet in 1898, and 54 millions in 1903. The increase was mainly due to the extended use of gas fires, cookers, engines, and prepayment meters. The net profit last year amounted to £999, and it was used in reducing the price of gas and the general district rate. There was no opposition to the application.

The Newcastle and Gateshead Gas Company announce an interim dividend of 4⅛ per cent., which is an increase of ⅛ per cent.

The Richmond Gas Stove and Meter Company, Limited, have recently held successful exhibitions at Fordingbridge, Carnarvon, and Stockport.

The Local Government Board have intimated to the Helmsley Rural District Council that they approve of the proposed loan for the water supply of Ampleforth by a scheme prepared by Mr. E. J. Silcock.

The Directors of the Brentford Gas Company will, at the forthcoming half-yearly meeting, recommend dividends for the six months ending June 30 at the rates of £5, £12, and £9 per cent. per annum; carrying forward £58,342.

Considerable excitement was caused last Thursday afternoon in Regent Street by an explosion of gas under the pavement. Two Post Office electric cable boxes and their contents were damaged, and several yards of the pavement were disarranged.

There has been an excellent response to the issue by the Gorleston and Southtown Gas Company of 500 new ordinary 7 per cent. shares of £10 each, representing £5000 capital. Applications were received for £9000; the capital being thus subscribed nearly twice over.

At the usual meeting of the Water Committee of the Oldham Corporation last Wednesday, it was decided to spend £100 on the purchase of young trees to plant round certain of the reservoirs, as it was considered that the more foliage there was about them the less would be the amount of evaporation.

The Brentford Gas Company have instructed Messrs. Samuel Cutler and Sons to instal the Jäger system of purification at their Brentford station; and the Halstead Gas Company—on the advice of their Engineer, Mr. J. T. Jolliffe, of Ipswich—have placed an order for four purifiers fitted on the Jäger system, with Messrs. Cutler, the sole licensees and manufacturers.

Messrs. Clapham Brothers, Limited, of Keighley, have received orders from the Wallasey Urban District Council for an installation of dry-lute purifiers, with their patent "Eclipse" rubber joint, together with valves and connections, and travelling crane; also for a Livesey washer for the Middlesbrough Corporation, and patent "Eclipse" condensers for the Bromley and Waterford Gas-Works.

It appears from a paragraph in the report of the Superintending Inspector of Factories (Mr. H. P. Smith) that arrangements have been made for carrying off and collecting the dust at the works of Messrs. Wilsons and Mathieson's, Limited, at Armley, Leeds, which have proved so efficient that on the visit of the inspectors the men were found to be working in comfort, and they expressed themselves in terms of satisfaction with what had been done.

Mr. J. T. Westcott, of the Economical Gas Apparatus Construction Company, Limited, reports that, notwithstanding the general business depression, both the American and English offices of his firm have considerable work in hand. This includes coal-gas plants for Berlin (Ontario), Owen Sound, and Winnipeg (the last-named having a daily capacity of 1,000,000 cubic feet), and carburetted water-gas plants for Rochester (Kent), Leeds, and the Primitiva Gas Company of Buenos Ayres—the latter under instructions from their Consulting Engineers, Messrs. H. E. Jones and Son, of Westminster.

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SPECIAL FEATURES.

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WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS ENGINEER. Marple Gas Department. Applications by July 30.
ENGINEER. Kirkby-in-Ashfield Gas Department. Applications by August 20.
DRAUGHTSMAN. No. 4246.
TRAVELLER. No. 4243.
WORKING FOREMAN. No. 4242.
CANVASSER. No. 4245.
GAS FITTER. Andover Gas Company.
JUNIOR CLERK. No. 4241.

Situations Wanted.

METER INSPECTOR AND COLLECTOR. No. 4235.
LEAKAGE EXPERT. No. 4232.
ASSISTANT MANAGER. No. 4178.

Plant, &c., Wanted.

PHOTOMETER. Barnard Castle Gas-Works.
TAR OR LIQUOR TANK. No. 4239.

Plant, &c., for Sale.

BOOKS: BRITISH ASSOCIATION PROCEEDINGS, REPORTS OF GAS ASSOCIATION, &c. No. 4247.
PURIFIERS. Neston Gas-Works.
ROOF PRINCIPALS AND PURLINS. Bournemouth Gas and Water Company.

Company Meetings.

BRENTFORD GAS COMPANY. Charing Cross Hotel, August 5, at Half-past Two o'clock.
BROMLEY GAS COMPANY. Bromley, August 9, at Six o'clock.
CRYSTAL PALACE DISTRICT GAS COMPANY. Albion Tavern, August 12, at Three o'clock.
GASLIGHT AND COKE COMPANY. Offices, August 5, at Twelve o'clock.
HORNSEY GAS COMPANY. London Offices, August 5, at Four o'clock.

TENDERS FOR

Coal.

ATHERTON GAS DEPARTMENT. Tenders by July 27.
BEVERLEY GAS DEPARTMENT. Tenders by July 28.
CLACTON GAS DEPARTMENT. Tenders by August 3.

Gas-Works (Complete).

BORDEAUX GAS COMPANY. Tenders by August 31.

Oil for Gas Making.

STRETFORD GAS COMPANY. Tenders by July 27.

Oxide of Iron.

SMETHWICK GAS DEPARTMENT. Tenders by Aug. 5.

BOOKS AND LEAFLETS

TO BE OBTAINED OF

WALTER KING,

11, BOLT COURT, FLEET STREET, E.C.

THE FLOW OF GASES AND PROPORTIONING GAS-MAINS.—By F. SOUTHWELL CRIPPS, Assoc. M.Inst.C.E. *Price 7s. 6d.*

REPORTS OF DISTRICT ASSOCIATIONS OF GAS ENGINEERS AND MANAGERS FOR 1903. *Price 5s. 6d.*

GAS COMPANIES' BOOK-KEEPING.—By JOHN HENRY BREARLEY and BENJAMIN TAYLOR, of Longwood. *Morocco Gilt*, 18s.

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SANDELL'S GAS COMPANIES' EXPENDITURE JOURNAL.—*Price, two quires*, 36s.; *three quires*, 45s.

SANDELL'S GAS COMPANIES' RENTAL-BOOK.—*Price, two quires*, 36s.; *three quires*, 45s.

SANDELL'S ANALYZED WAGES BOOK.—*Price, two quires*, 15s.

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THE CHOICE OF GAS-FIRES.—By THOS. FLETCHER, F.C.S. *Price 3s. per* 100. Special Quotations for large Quantities.

GAS AND HOW TO USE IT.—By J. H. TROUGHTON. *Sample copies 6d. each.* 100, £2; 250, £4 10s.; 500, £7 10s.; 1000, £10.

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MODERN METHODS OF SAVING LABOUR IN GAS-WORKS.—By C. E. BRACKENBURY. *Price 3s. 6d.*

MODERN APPLIANCES IN GAS MANUFACTURE.—By FLETCHER W. STEVENSON. *Price 5s.*

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GASHOLDER AND TANK AT THE SUTTON GAS-WORKS (one million cubic feet capacity).—By F. SOUTHWELL CRIPPS, Assoc.M.Inst.C.E. *Price 3s. 6d.*

CLOTH CASES for Binding the Quarterly Volumes of the "JOURNAL OF GAS LIGHTING," gilt lettered. *Price 2s.* each.

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PRACTICAL PHOTOMETRY: A GUIDE TO THE STUDY OF THE MEASUREMENT OF LIGHT.—By W. J. DIBDIN, F.I.C., F.C.S., late Chemist and Superintending Gas Examiner to the London County Council. *Price 7s. 6d.*

CHEMICAL TECHNOLOGY.—ELECTRIC LIGHTING. By A. G. COOKE, M.A., A.M.Inst.C.E. PHOTOMETRY. W. J. DIBDIN, F.I.C., F.C.S. 1 Vol. *Price 2Cs.*

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GAS ANALYSTS' MANUAL.—By JACQUES ABADY. *Price 18s.*

GAS ENGINEERS' LABORATORY HANDBOOK.—By J. HORNBY. *Price 6s.*

GAS AND FUEL ANALYSIS.—By A. H. GILL. *Price 5s. 6d.*

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Referred to on p. 253.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest-ment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 14	10½	Alliance & Dublin 10 p.c.	19½–20½	..	5 2 5
100,000	10	,,	7½	Do. 7 p.c.	13–14	..	5 7 2
200,000	5	May 12	6½	Bombay, Ltd.	6–6½	..	5 4 0
140,000	5	,,	6½	Do. New, £4 paid	4¾–5¼	..	4 18 11
380,000	Stk.	Feb. 25	12	Brentford Consolidated	242–247	..	4 17 2
300,000	,,	,,	9	Do. New	182–187	..	4 16 3
50,000	,,	,,	5	Do. 5 p.c. Pref.	127–132	..	3 15 9
206,250	,,	June 10	4	Do. 4 p.c. Deb.	102–105	..	3 16 2
220,000	Stk.	Mar. 10	10¾	Brighton & Hove Orig.	212–217	..	4 19 1
246,320	,,	,,	7¼	Do. A. Ord. Stk.	150–155	..	5 0 0
460,000	20	Apl. 14	10	British	39–40	+½	5 0 0
100,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c.	116–120	..	5 0 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	90–95	..	4 14 9
500,000	10	May 12	7	Buenos Ayres (New) Ltd	10¾–11¼	..	6 4 5
250,000	Stk.	June 29	4	Do. 4 p.c. Deb.	92–94	..	4 5 1
150,000	20	July 14	8½	Cagliari, Ltd.	21–23*	..	7 3 6
100,000	10	May 27	10	Cape Town & Dis., Ltd.	14–15	..	6 13 4
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	51–53	..	5 13 2
1,375,000	Stk.	Feb. 25	5⅛	Commercial 4 p.c. Stk.	110–114	..	4 11 3
536,485	,,	,,	5	Do. 3½ p.c. do.	106–109	..	4 11 9
442,947	,,	June 10	3	Do. 3 p.c. Deb. do.	85–87	..	3 9 0
800,000	Stk.	June 10	7	Continental Union, Ltd.	110–115	..	6 1 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	142–147	..	4 15 3
575,000	Stk.	Feb. 25	5½	Crystal Palace Ord. 5 p.c.	118–123	..	4 6 8
60,000	,,	,,	5	Do. 5 p.c. Pref.	120–125	..	4 0 0
112,533	,,	July 14	5	Do. 5 p.c. Deb. Stk.	133–138*	..	3 12 6
486,090	10	July 14	11	European, Ltd.	19–20*	+½	5 10 0
354,060	10	,,	11	Do. £7 10s. paid	13–14*	..	5 17 10
15,243,200	Stk.	Feb. 11	4⅛	Gas-light and Coke { 4 p.c. Ord.	94–96	..	4 11 8
2,600,000	,,	,,	3½	{ 3½ p.c. max.	88–90	..	3 17 9
3,799,735	,,	,,	4	{ 4 p.c. Con. Pref.	108–111	..	3 12 1
4,193,975	,,	June 29	3	Coke { 3 p.c. Con. Deb.	£8–90	..	3 6 8
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	90–95	..	5 5 3
70,000	10	Apl. 28	11	Hongkong & China, Ltd.	15–16	..	6 17 6
3,800,000	Stk.	May 12	10	Imperial Continental	202–205	..	4 17 7
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	97–99	..	3 10 8
165,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	113–118	..	5 1 8
561,000	Stk.	Feb. 25	10	Liverpool United A	217–218	+1	4 11 9
718,100	,,	,,	7	Do. do. B	162–164	..	4 5 4
306,083	,,	June 29	4	Do. do. Deb. Stk.	106–108	..	3 14 1
75,000	5	June 29	5	Malta & Medn., Ltd.	4¼–4⅝	+¼	5 5 3
560,000	100	Apl. 5	5	Met. of { 5 p.c. Deb.	102–105	..	4 15 3
250,000	100	,,	4½	Melbourne { 4½ p.c. Deb.	103–102	..	4 8 3
541,920	20	May 27	3½	Monte Video, Ltd.	9–10	..	7 0 0
1,515,892	Stk.	Feb. 26	4½	Newc'tle & G'tesh'd Con.	106⅛–107	+¼	4 4 1
406,025	Stk.	July 1	3½	Do. 3½ p.c. Deb.	90–92½	–⅛	3 15 8
300,000	Stk.	May 12	8	Oriental, Ltd.	138–143	..	5 11 11
600,000	5	Mar. 29	7	Ottoman, Ltd.	5⅞–6⅛	..	5 12 0
				*Ex div.			

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest-ment.
£			p.c.	GAS COMPANIES.			£ s. d.
235,005	Stk.	—	6½	Ply'mth & St'house 5 p.c	—	..	—
851,070	10	Apl. 28	7	River Plate Ord.	10¾–11¼	..	6 4 5
300,000	Stk.	June 29	4	Do. 4 p.c. Deb.	93–95	..	4 4 3
250,000	10	Mar. 29	7	San Paulo, Ltd.	10½–11½	..	6 1 9
135,000	Stk.	Mar. 10	10	Sheffield A	237–239	..	4 3 8
209,984	,,	,,	10	Do. B	236–238	..	4 4 0
523,498	,,	,,	10	Do. C	234–236	..	4 4 9
116,106	Stk.	—	5	Shrewsbury Ord. 5 p.c.	—	..	4 10 11
6,150,000	Stk.	Feb. 11	5½	South Met., 4 p.c. Ord.	125–127	..	4 3 11
1,832,700	,,	July 14	3	Do. 3 p.c. Deb.	87–89*	..	3 7 5
380,940	Stk.	May 12	5	Southampton Ord.	105–110	..	4 10 11
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Feb. 25	6	Tottenham and Edmonton { A. 5 p.c.	122–125	..	4 16 0
313,020	,,	,,	4½	{ B. 3½ p.c.	97–102	..	4 8 3
182,380	10	June 10	8	Tuscan, Ltd.	£3½–8½	..	9 2 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	56–58	..	5 2 0
745,872	Stk.	Mar. 10	5	West Ham, 5 p.c. Ord.	97–102	..	4 18 0
				WATER COMPANIES.			
782,322	Stk.	June 29	12	Chelsea, Ord.	360–370	..	3 4 10
150,000	,,	,,	5	Do. 5 p.c. Pref.	157–162	..	3 1 9
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	142–147	..	3 1 3
175,785	,,	Mar. 29	4½	Do. 4½ p.c. Deb.	137–142	..	3 3 5
1,720,560	Stk.	Mar. 29	8	East London, Ord.	225–230	..	3 9 7
654,740	,,	June 29	4½	Do. 4½ p.c. Deb.	135–140	..	3 4 4
1,524,288	,,	,,	3	Do. 3 p.c. Deb.	91–94	..	3 3 10
700,000	50	June 10	12	Grand Junction { 10 p.c. max.	137–142	..	4 4 6
310,000	Stk.	Mar. 29	4	{ 4 p.c. Deb.	122–126	..	3 3 6
708,000	Stk.	Feb. 25	10	Kent	325–335	..	2 19 8
160,000	,,	,,	7	Do. New, 7 p.c. max.	230–240	..	2 18 4
1,043,800	100	June 29	11	Lambeth, 10 p.c. max.	320–325	..	3 7 8
436,200	100	,,	8½	Do. 7½ p.c. max.	235–240	..	3 10 10
550,000	Stk.	Mar. 29	4	Do. 4 p.c. Deb.	120–125	..	3 4 0
500,000	100	Feb. 25	10	New River, New Shares	310–330	..	3 0 7
1,000,000	Stk.	Jan. 28	4	Do. 4 p.c. Deb.	122–126	..	3 3 6
902,300	Stk.	June 29	7½	South-wark { Ord.	280–285	..	2 12 7
126,500	100	,,	7½	{ 7½ p.c. max.	215–225	..	3 6 8
489,200	Stk.	,,	5	and { 5 p.c. Pref.	145–150	..	3 6 8
1,019,585	,,	Mar 29	4	Vauxhall { 4 p.c. A Deb.	120–125	..	3 4 0
1,155,066	Stk.	May 27	10	West Middlesex	303–308	..	3 4 10
200,000	,,	June 10	4½	Do. 4½ p.c. Deb.	137–142	..	3 3 5
200,000	,,	Mar. 10	3	Do. 3 p.c. Deb.	91–94	..	3 3 10
				*Ex div.			

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

BANK HOLIDAY.

In consequence of the BANK HOLIDAY (Aug. 1), Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS should be received at the Office NOT LATER than the FIRST POST ON SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in Advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1371a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

SPENT OXIDE.

THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

TO GAS AND WATER OFFICIALS.

MELROSE CYCLES and Slot Copper COLLECTORS. Latest Design and lowest Prices. For Cash or gradual payments. Catalogue free.
MELROSE CYCLE COMPANY, COVENTRY.

COAL GAS TAR wanted.
ROBINSON BROTHERS, LIMITED. Works: WEST BROMWICH, KNOTTINGLEY, and SPONDON.

ATTERTON'S Patent Charging Machine, especially adapted for Small Works up to 50 Millions. Nearly 40 already supplied, and still supplying. Would soon repay for small outlay. Increased make and reduction in cost.
Apply to E. PADFIELD AND CO., 96 & 98, Leadenhall Street, LONDON, E.C.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS AND TRADE MARKS PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

COAL GAS TAR wanted.
BEST PRICES GIVEN.
SHARPNESS CHEMICAL COMPANY, LIMITED, Sharpness Docks, GLOS.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd., (Eerste Hollandsche Yzererts Maaty), ROTTERDAM.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA
SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SITUATION wanted in a Gas Office as METER INSPECTOR and COLLECTOR (Security), or as FITTER. Nine Years' General Experience. Good Testimonials.
Address No. 4235, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

LEAKAGE.

EXPERT is open to advise as to the best method of decreasing Leakage. Competent Men sent to all parts of the Country to conduct testing. Results Guaranteed.
Address No. 4232, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

APPOINTMENT wanted as Assistant-MANAGER in Gas-Works. Trained at Engineering Works. Recently prepared Drawings and Superintended erection of large up-to-date Gas-Works. Good knowledge of Chemistry and Gas-Works routine. Honours Gas Manufacture.
Address No. 4178, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TRAVELLER wanted by an Old-Established Firm of Gas-Meter Manufacturers.
Apply, by letter, with full Particulars, to No. 4243, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, immediately, a First-Class CANVASSER for a Gas Company in the South of England. Must be well up in all the latest Gas-Fittings, Cookers, and Fires, and must have a good knowledge of costs of Gas and Electricity, &c. Good Salary for a suitable man.
Applications, together with Full Particulars and References, also Salary required, to be addressed to No. 4245, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.
BALE'S FIRE CEMENT, PAINT, AND GAS COAL.
5, CROOKED LANE, LONDON, E.C.

WANTED, for a large Provincial Gas-Works, a competent DRAUGHTSMAN. Must have had Experience in Gas-Works. Salary according to qualifications.
Apply, by letter, to No. 4246, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

JUNIOR Clerk Wanted, immediately, in Rental and Fittings Department. Experience in General Office Routine and in Collecting from Coin Meters essential. Wages, 25s. per week.
State Age, present Employment, and full Particulars to No. 4244, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-FITTER.

WANTED a good, reliable, Mechanic— one having a thorough practical, up-to-date knowledge of Incandescent and all classes of fittings.
Apply, by letter, stating Experience, with *copies* of Testimonials, Age, and Wages required, to the MANAGER, Andover Gas and Coke Company, Limited, ANDOVER.

WANTED, a good general Carbonizing WORKING FOREMAN, for Shovel Charging. Good Carbonizer, well acquainted with the general routine of a Gas-Works, including Regenerative Settings, Boiler, Exhauster, and Sulphate Plant. Permanent job for a steady suitable man. Size of Works, 30 Million cubic feet. Sixty miles from London.
Apply, by letter, stating Age and Wages required, with *copies* of recent Testimonials, to No. 4242, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

KIRKBY-IN-ASHFIELD URBAN DISTRICT COUNCIL'S GAS ACT, 1904.

GAS-WORKS

THE Kirkby-in-Ashfield Urban District Council require an ENGINEER to design and superintend the construction of a Gas-Works.
Offers, sealed and superscribed "Engineer," to be sent to me not later than the 20th prox.
By order,
G. H. HIBBERT,
Clerk to the Council.
47, West Gate, Mansfield,
July 23, 1904.

MARPLE URBAN DISTRICT COUNCIL.

APPLICATIONS are invited for the appointment of GAS ENGINEER to the above Council. Salary £120 per annum. Candidates must have had practical Experience, be Competent to keep the necessary Books and Accounts, and to take the Entire Management of the Gas Undertaking. The person appointed will be required to devote the whole of his time to the duties of the Office, and to attend the meetings of the Council and Gas Committee. One month's notice on either side to determine the Appointment.
Further Particulars may be had from Mr. Charles Hague, the present Gas Manager.
Applications, stating Age, Qualifications, and Experience, and accompanied by *copies* of not more than Three recent Testimonials, to be sent to the Chairman of the Council, addressed to these Offices, on or before Saturday, the 30th of July next, endorsed "Gas Manager."
By order,
CHARLES F. JOHNSON,
Clerk to the Council.
Public Offices, Marple,
July 19, 1904.

WANTED, a Photometer in good working condition, suitable for a small Gas Works. (Annual make 33 Millions.)
Apply to ROBT. WOOD, Gas Office, BARNARD CASTLE.

WANTED, a Cast-Iron Rectangular TAR or LIQUOR TANK, about 40 ft. by 10 ft. by 10 ft.
Address No. 4239, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

FOR SALE—Two 6 feet by 6 feet Puri- FIERS, by Dempster, with two Four-Way Valves. Replaced by larger.
Apply to A. E. ASHLEY, Manager, Gas-Works, NESTON.

TAR Contracts Wanted on the Sliding- Scale or at Fixed Prices.
Managers and Secretaries desirous of selling to best advantage, please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

SECOND-HAND BOOKS FOR SALE.

A GAS Manager's Widow is desirous of disposing of the following BOOKS: "Proceedings of the British Association of Gas Managers," 1863 to 1889 (the volume for 1870 is missing). "Reports of Gas Associations," 1883 to 1899. "Proceedings of the Gas Institute," 1890 to 1900 (the volume for 1895 is missing).
Address offers to No. 4247, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GASHOLDERS AND TANKS FOR SALE.

TWO splendid Double-Lift Gasholders, in Cast-Iron Tanks—40,000 and 60,000 cubic feet Capacity respectively, WILL BE SOLD at a sacrifice to immediate purchasers to save carriage. Now being Dismantled, and could be erected for use for the coming Winter if sold at once.
Full Particulars and Photographs on application to FIRTH BLAKELEY AND CO., Gas Engineers, Thornhill, YORKS.

GASHOLDER, 40 ft. diameter by 14 ft. deep, in wrought Tank, with six Columns, trellis Girders, and Suspension Gear. In splendid condition. Nearly new.
New GASHOLDER, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.
Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

THE Bournemouth Gas and Water Company have the following Wrought-Iron ROOF PRINCIPALS and PURLINS to dispose of:—
Sixteen Principals of 5-in. by 4-in. Rafters, 3-in. by 3-in. Struts, 1¼-in. Tie-Rods, Span 57 ft. 6 in. to ends of Rafters, with Slate Laths, &c., Complete, spaced 6 ft. 2½ in. apart, covering Building 105 ft. by 53 ft., inside walls.
Total Weight approximately 26 Tons.
The above in condition equal to new.
Apply to H. W. WOODALL, Engineer and General Manager.

BOROUGH OF SMETHWICK.
(GAS DEPARTMENT.)

OXIDE OF IRON.

TENDERS are invited for about 250 Tons of OXIDE OF IRON, delivered by Boat at the Gas-Works, Smethwick, in such quantities and at such times as may be required.
Tenders to be sent to the undersigned not later than the 5th of August.

By order,
W. J. STURGES,
Secretary.

Gas Offices, Town Hall, Smethwick,
July 22, 1904.

CLACTON URBAN DISTRICT COUNCIL.

THE above Council invite Tenders for the supply and delivery of about 4000 Tons of best screened GAS COAL at Clacton-on-Sea, in quantities as may be required during the ensuing Twelve Months.
Particulars and Form of Tender may be obtained upon application to the Engineer, Mr. Sydney Francis, Assoc.M.Inst.M.E., Town Hall, Clacton-on-Sea.
Tenders, sealed and endorsed "Tender for Coal," to be delivered to the undersigned not later than noon on Monday, the 3rd day of August, 1904.
The Council do not bind themselves to accept the lowest or any Tender.

GEO. T. LEWIS,
Clerk to the Council.

Town Hall Buildings, Clacton-on-Sea.
July 20, 1904.

STRETFORD GAS COMPANY.

GAS-OIL.

THE Directors of the Stretford Gas Company invite TENDERS for the supply of 1000 to 1200 Tons of GAS OIL, to be delivered during the ensuing Twelve Months. The Oil to be suitable for use in a Carburetted Water-Gas Plant; the specific gravity to be not less than 0·825 nor more than 0·885; and the flashing-point to be not less than the Government standard. The amount of Sulphur in grains per gallon to be stated in the Tender.
Delivery preferred in Road Tank-Waggons into the Gas-Works. There being no Railway communication, quotations will be entertained for delivery to Stretford Station in Rail Tank-Waggons, or by barge to the Gas-Works on the Bridgewater Canal.
Sealed Tenders, addressed to the Chairman, with full Particulars as to kind and source of Oil, to be delivered to the Gas-Works not later than Twelve noon on Wednesday, the 27th day of July, 1904.

By order,
BENJAMIN HAYNES,
Secretary.

THE Urban District Council of Atherton invite TENDERS for the supply of about 6500 Tons of screened GAS COAL or NUTS from the 1st of September, 1904, to the 31st of August, 1905.
Forms of Tender and further Information may be had from the undersigned, to whom Tenders should be delivered on or before Wednesday, July 27, inst.

D. SCHOFIELD,
Clerk.

Town Hall, Atherton,
Lancs., July 13, 1904.

BOROUGH OF BEVERLEY.

TENDERS FOR COAL.

THE Gas Committee are desirous to receive TENDERS for the supply of not exceeding 7000 Tons of COAL for use at the Gas-Works, Beverley, for a period of Twelve Months from the 1st of October next, to be delivered as from time to time directed and at the expense of the Contractors f.o.b. at Keadby, or at the pits, or at the Railway Station, Beverley, according to Terms of Contract. The Coal to be of the best kind, well screened, free from Sulphur, Bats, Bind, Refuse, and Dirt, and to be weighed 21 cwt. to the Ton upon the Corporation Machine.
Payments will be made from time to time so long as the Contractor shall duly fulfil the Contract.
The Corporation do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to divide the Contract as they think fit.
Further Information may be obtained of the Gas Manager, Mr. F. W. Oldfield, at the Gas-Works, Beverley; and Tenders, endorsed "Tender for Coals," must be delivered at my Office not later than Thursday, the 28th day of July, 1904, at Ten a.m.

J. WILLIS MILLS,
Town Clerk.

NEW GAS-WORKS FOR BORDEAUX.

THE Bordeaux Gas Company Hereby Give Notice that they are about to erect new Works, equipped with all the latest improvements, of a minimum productive capacity of 15 Million cubic metres (about 530 Million cubic feet) per annum; and they invite the co-operation of Engineers or Firms of Gas-Works Constructors to submit PROPOSALS for the same.
The Works are to be ready for use before the expiration of 20 Months from the present time.
The Company will award Three Premiums of 300 frs. and two of 500 frs. to those who submit the best designs. All projects, whether premiated or not, will remain the property of the Company, who will make such use of them as they may deem advisable in the construction of the Works; and no undertaking will be given to the authors that they will be treated with for such use, whether wholly or partially.
Particulars of the nature of the installation, accompanied by a general plan of the site, will be sent on application to the undersigned; and all proposals must be submitted by the 31st prox. at the latest.

JULES AVRIL,
Engineer and Manager.

5, Rue de Condé, Bordeaux,
July 20, 1904.

BRENTFORD GAS COMPANY.

NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors will be held at the Charing Cross Hotel, London, on Friday, the 5th of August next, at Half-past Two o'clock precisely, to transact the usual Business, including the declaration of a Dividend for the Half Year ended the 30th day of June last.

By order,
WILLIAM MANN,
Secretary.

Office, Brentford,
July 20, 1904.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the "Bell" Hotel, Bromley, Kent, on Tuesday, the 9th day of August, 1904, at Six o'clock p.m. precisely, to receive the Report of the Directors, the Balance-Sheet certified by the Auditors, to declare a Dividend, and to transact generally the business of a General Meeting.
A Resolution for the raising of further monies by the creation and issue of Debenture Stock will be submitted at this meeting.
The TRANSFER BOOKS WILL BE CLOSED from the 23rd of July, to the 9th of August, 1904, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices: 156, High Street,
Bromley, Kent, July 23, 1904.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 12th day of August, 1904, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June last, to declare a Dividend for the same period, and for General Purposes.
Notice is Hereby also Given, that, immediately after the conclusion of the business of the Ordinary Meeting, an EXTRAORDINARY or SPECIAL GENERAL MEETING will be held for the consideration of a scheme enabling the employees holding Ordinary Stock of the Company to elect Directors, pursuant to the provisions of the Crystal Palace District Gas Act, 1904.
The TRANSFER BOOKS WILL BE CLOSED from the 29th day of July until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works:
Lower Sydenham, S.E.,
July 25, 1904.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at this Office on Friday, the 5th day of August next, at Twelve o'clock (noon) precisely, to transact the usual Business, including the declaration of a Dividend for the Half Year ending on the 30th day of June last.
Notice is Hereby also Given, that, at such Meeting, the Directors will submit to the Proprietors, for their approval, a Resolution with reference to the remuneration of the Secretary.

By order,
H. RAYNER,
Secretary.

Chief Office: Horseferry Road,
Westminster, S.W., July 19, 1904.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Offices of the Company, No. 63, Chancery Lane, in the County of London, on Friday, the 5th day of August, 1904, at Four o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th of June last, to declare Dividends, and to transact the Business of an Ordinary General Meeting.
The TRANSFER BOOKS WILL BE CLOSED from the 23rd day of July to the 5th of August, both days inclusive.

By order of the Board,
WILLIAM E. ROBERTS,
Secretary.

Offices: 63, Chancery Lane,
London, W.C., July 21, 1904.

METROPOLITAN WATER BOARD.

Chelsea Water-Works Company.—Perpetual 4½ per cent. Debenture Stock.
Chelsea Water-Works Company.—2¾ per cent. Debenture Stock.
Chelsea Water-Works Company.—3 per cent. Debenture Stock.
East London Water-Works Company. — Debenture Stock, 4½ per cent. per annum, free of income-tax.
East London Water-Works Company.—3 per cent. Debenture Stock.
Grand Junction Water-Works Company.—Perpetual 4 per cent. Debenture Stock.
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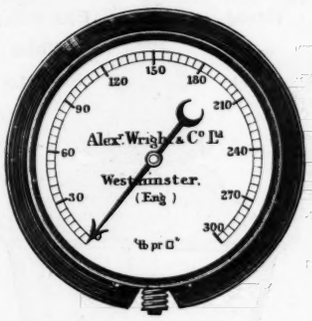

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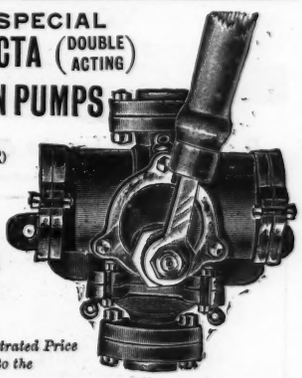

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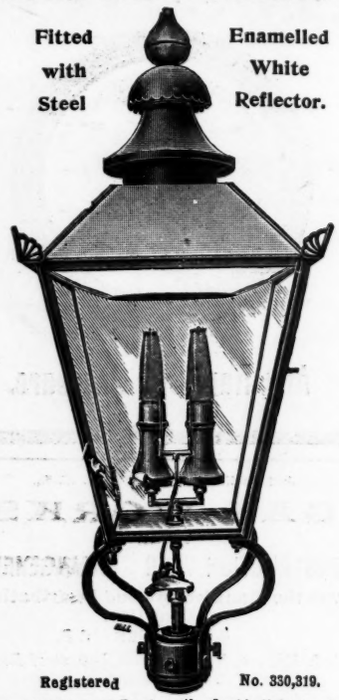

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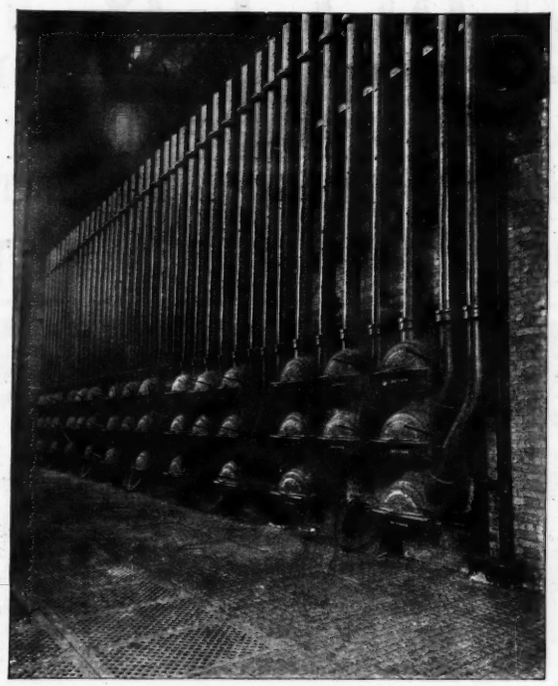

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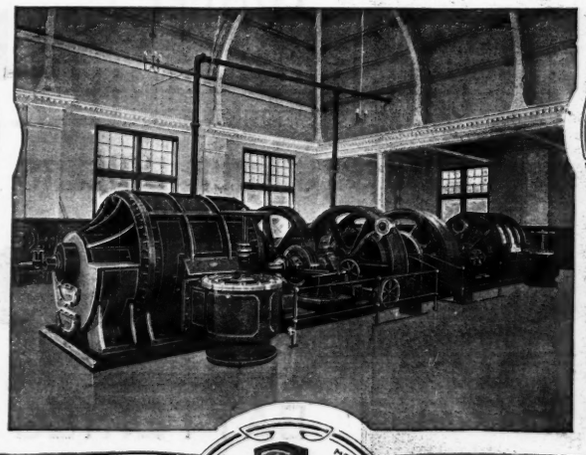

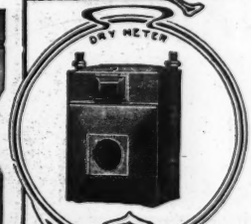

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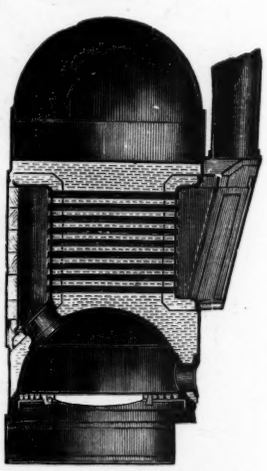

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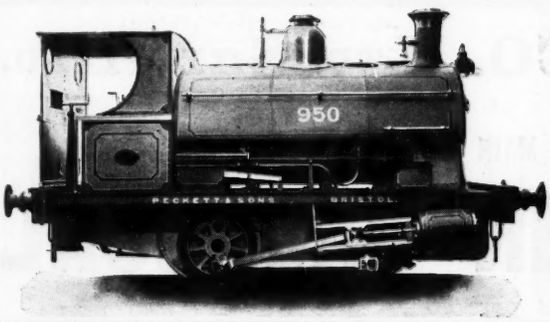

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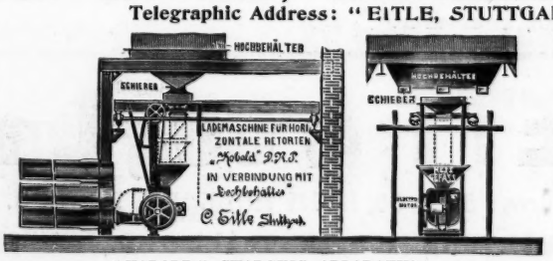

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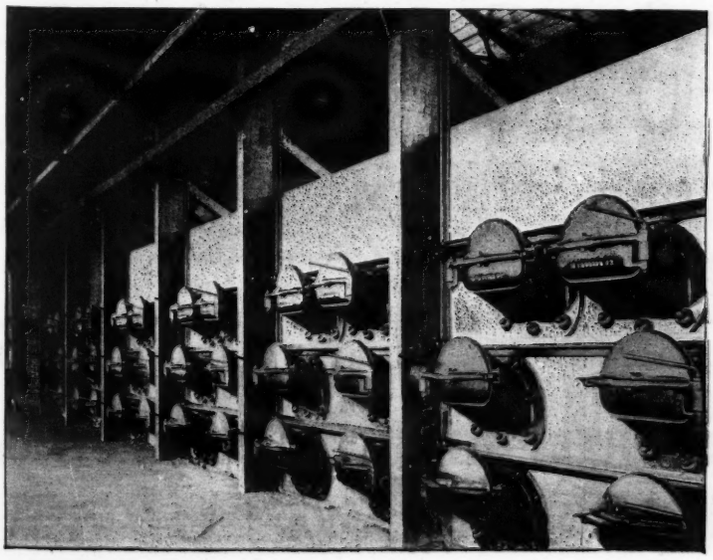

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[See Illustrated Advertisement, July 5, p. 70.]

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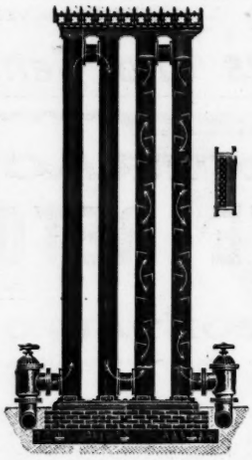

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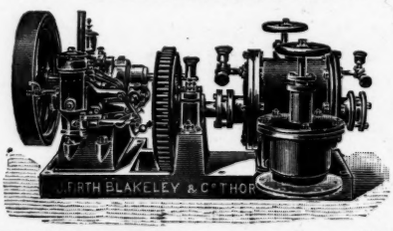

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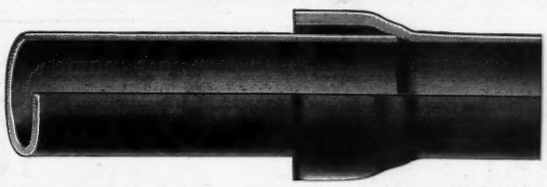

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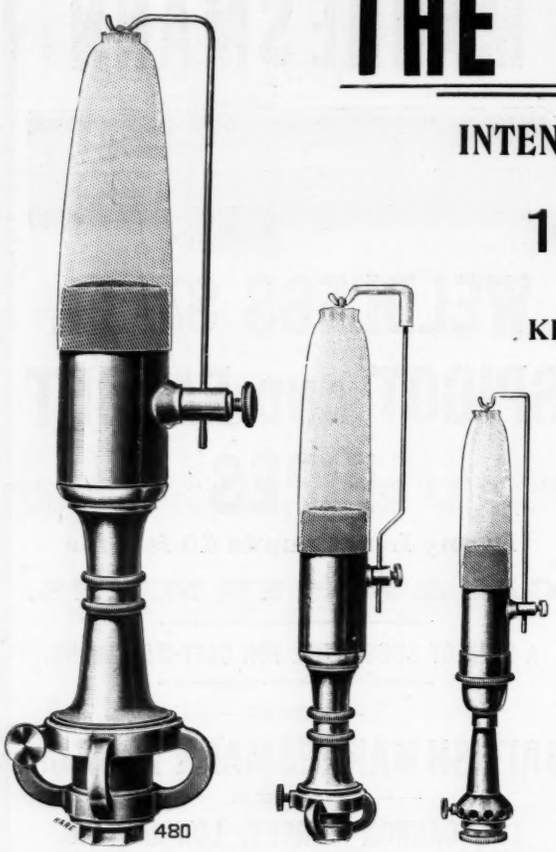

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